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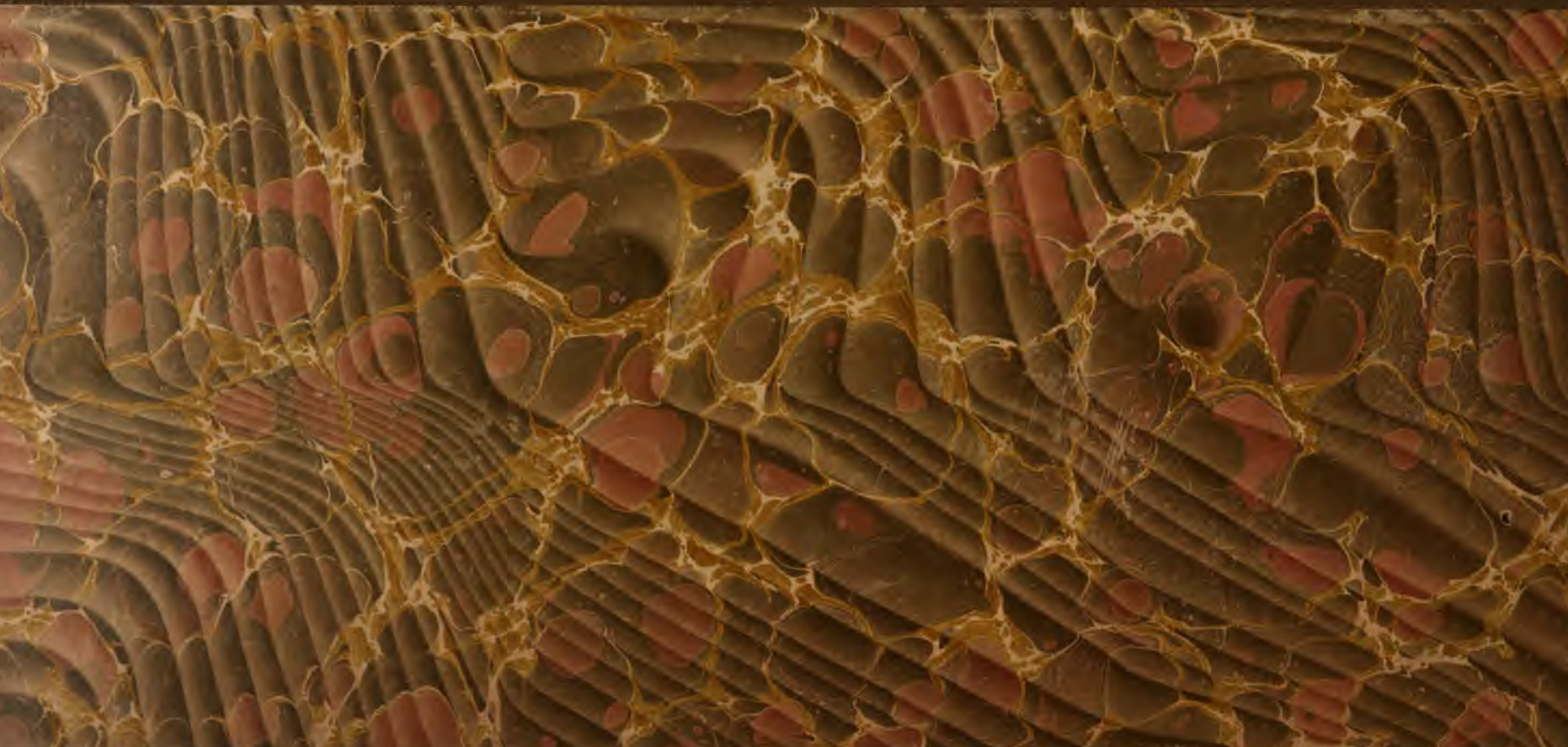

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DEPARTMENT OF THE INTERIOR

IRRIGATION

IN THE

PROVINCES OF ALBERTA AND SASKATCHEWAN

1906 AND 1907

Scene on Canal near Strathmore, C.P.R.

DEPARTMENT OF THE INTERIOR

IRRIGATION

IN THE

PROVINCES OF ALBERTA AND SAKATCHEWAN

1906 AND 1907

Published by authority of the HON. FRANK OLIVER, Minister of the Interior.

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LIST OF ILLUSTRATIONS

IRRIGATION OFFICE,
CALGARY, November 1, 1907.

The Hon. FRANK OLIVER,
Minister of the Interior,
Ottawa.

SIR,—I have the honour to submit the following general report on irrigation and irrigation development in the Provinces of Alberta and Saskatchewan.

I have the honour to be, sir,
Your obedient servant,

JOHN STEWART,
Commissioner of Irrigation.

INTRODUCTION.

Irrigation is a subject which is receiving a great deal of attention at the present time throughout the Provinces of Alberta and Saskatchewan.

The benefit derived from irrigation has been demonstrated within the past few years, now the system has taken root, and is bound to grow, as the following figures will show. Some five years ago there were 169 irrigation ditches, having a total length of 469 miles and capable of irrigating some 614,000 acres. At the present time there are 272 irrigation schemes, with a total length of 922·92 miles, and capable of irrigating 3,033,009 acres. Of this number Alberta has 167 ditches, with a total length of 748·58 miles, capable of irrigating 2,998,321 acres; Saskatchewan has 105 ditches, with a total length of 174·34 miles, capable of irrigating 34,688 acres.

One thing that has developed irrigation throughout the provinces is the government system of selling land under the Irrigation Act, that is, selling land at three dollars per acre and allowing the cost of the ditch to apply on the purchase price, up to two dollars per acre. This brings a large tract of land under cultivation that would not otherwise be cultivated but would remain for grazing purposes.

The following report has been prepared to deal with the subject under different heads.

10221—1½

METEOROLOGICAL STATISTICS.

COMPILED BY THE DOMINION GOVERNMENT WEATHER OBSERVATION STATION AT CALGARY.

YEARS 1900 TO 1906, INCLUSIVE.

RAINFALL IN INCHES.

Year.	Jan.	Feb.	Mar.	April.	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
1900 ...	0·00	0·02	0·30	0·43	1·32	3·56	2·00	1·29	4·50	0·39	1·60	0·00	15·41
1901....	0·40	1·15	0·95	0·90	1·55	7·04	3·94	0·51	3·15	0·12	0·40	1·20	21·31
1902....	0·40	0·65	0·62	0·60	8·99	9·82	5·06	6·23	1·22	0·61	1·00	0·60	35·71
1903....	0·00	0·50	0·88	0·29	3·97	2·07	4·09	7·62	1·80	0·00	0·60	0·16	21·98
1904....	0·16	0·10	0·80	0·14	1·56	1·86	1·74	2·75	0·38	1·35	0·12	0·20	11·16
1905....	1·04	0·30	0·65	0·60	1 67	8·52	0·91	0·56	0·35	0·31	1·20	0·00	16·51
1906....	0·04	0·04	0·66	0·37	6·96	2·35	1·15	2·95	0·04	0·90	0·34	0·34	16·14

HIGHEST TEMPERATURE.

Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1900.....	50·0	50·0	60·0	76·0	79·0	92·0	85·0	90·0	77·0	71·0	64·0	50·0
1901.....	45·0	57·0	55·0	72·0	86·0	77·0	80·0	85 0	75·0	74·0	60·0	60·0
1902.....	54·0	46·0	50·9	65·0	82·0	76·0	84·0	81·0	75·0	74·0	60·0	47·0
1903	51·0	47·0	48·0	66·0	84·0	81·0	81·0	80·0	76·0	79·0	68·0	53·0
1904.....	49·0	38·0	46·0	76·0	76·0	85·0	94·0	85·0	78·0	75·0	60·1	52·0
1905..... ..	46·0	57·0	66·0	78·0	80 0	85·0	91·0	86·0	80·0	72·0	70·0	47·0
1906.....	54·0	61·0	73·0	79·0	82·0	77·0	88·0	92·0	82·0	77·0	60·0	50·0

LOWEST TEMPERATURE.

Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1900.... .	-15·0	-27·0	-22·0	21·0	28·0	30·0	36·0	30·0	17·0	11·0	30·0	- 3·0
1901.....	-35·0	-18·0	-10·0	13·0	29·0	32·0	37 0	35·0	23·0	18·0	- 5·8	3·8
1902	-30·0	-18·0	-24·0	14·0	25·0	29·0	38·0	31 0	24·3	22·0	-16·0	-26·8
1903.....	-12·8	-18·0	-25·0	16·0	23·0	34·0	38·0	36·0	26·0	18·0	-20·0	-22·0
1904.....	-22·0	-25·0	-25·8	18·0	23·0	26·0	34·6	32·0	21·0	21·0	6·0	-22·0
1905.....	-20·0	-40·0	- 1·0	2·0	24·0	32·0	40·0	33·0	22·0	3·0	-25·0	-10·0
1906.....	-32·0	-16·0	-24·0	18·0	18·0	36·0	40·0	34·0	24·0	22·0	- 8·0	-26·0

MEAN TEMPERATURE.

Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1900	21·9	10·5	27·5	43·5	51·4	57·0	58·0	54·5	46·7	38·2	20·7	27·0
1901	15·8	15·4	30·0	38·3	52·0	49·3	58·7	59·0	44·2	47·8	28·5	26·0
1902	19·6	15·2	25·3	39·8	47·0	49·1	59·0	57·2	48·8	44·4	21·8	11·9
1903	20·5	21·5	14·0	35·5	45·5	57·1	56·7	55·4	46 0	45·1	22·1	25·9
1904	18·1	1·8	13·3	42·8	47·1	53·7	55·4	55·7	50·5	43·4	35·2	20·5
1905	9 6	15·1	35·2	39·1	47·5	52·5	60·8	59·4	50·7	37·3	33·2	24·5
1906	16·11	20·4	25·5	45·5	45·7	55·8	64·1	59·1	51·1	44·3	27·08	12 01

IRRIGATION DEVELOPMENT.

The development of irrigation which has taken place in the provinces of Alberta and Saskatchewan will probably be better illustrated by putting the ditches constructed into schedule form, showing the name of owner, source of supply, length of ditch and area to be irrigated. Several of the larger irrigation canals which are included in the schedule and intended to supply water for the irrigation of extensive areas will be dealt with separately.

IRRIGATION DEVELOPMENT IN THE PROVINCE OF ALBERTA.

SCHEDULE of Canals and Ditches constructed and authorized to be constructed up to date.

Name.	Source of Supply.	Length of Ditch.	Acreage to be Irrigated.
		Miles.	
Aird, James	North Fork, Sheep River	0·4	110
Anderson, G., sen.	" "	0·4	20
Austin & Mathewson	Sheep River.	1·2	70
Alberta Ranche Co.	Pincher Creek.	1·1	270
Alberta Ry. and Irrigation Co.	St. Mary River	200·0	500,000
Anderson, H	Creek	7·5	78
Alberta Stake of Zion	Waterton River	18·5	67,500
Allred, I. W.	Crooked Creek and Little Crooked Creek	2·25	310
Bell, Mary	North Fork, Sheep River	0 9	100
Burn, H. St. G.	Connelly Creek	0·25	100
Bateman, Bateman & Barker	Lee Creek	1·0	70
Bremner, J. L.	Fish Creek	1·6	115
Burns, P.	"	1·04	880
Burns, P.	Bow River	2·0	
Burns, P.	"	3·15	170
Blake, George	Spring Creek.	0·6	41
Bedingfeld, F. N	Lake	1·75	171
Burton, F. A.	Burton Creek	0·75	59
Brayne, Henry	Spring Creek.	0·75	45
Brown, J. H.	Pekisko Creek	1·25	183
Burton, F. A.	Creek	1 2	82
Burton, F. A.	Trout Creek, Spring Creek and a Spring.	3·25	238
Cochrane Ranche Co	Belly River	3·1	200
Cooke, H. E. G.	Dogpound Creek.	1·0	80
Cochrane, Kenneth	South Fork, Sheep River.	4 0	685
Canadian Pacific Railway Co.	Bow River	200·0	2,250,000
Cyr, Cyr & Pelletier	Stead Creek	1·5	600
Cross, A. E.	Ranche Creek and Dry Timber Creek	1·62	122
Carey, E. E	North Fork, Sheep River	0·8	107
Collins, Peter	Big Hill Creek.	1·5	68
Cross, A. E.	West Branch, Dry Timber Creek	2·04	200
Comer, R. P.	Big Plume Creek.	1·40	100
Cooper, Sydney	Spring Creek.	1·5	96
Cooper, J. T.	Mosquito Creek	2·7	347
Coughlin, C	Nanton Creek	2·25	174
Conley, G. M.	Spring Creek.	1·00	105
Connell, A	Creek	0·75	210
Conrad Circle Cattle Co.	Spring Creek.	1·25	75
Conrad Circle Cattle Co.	"	0·15	2
Comstock, F. N.	Two Spring Creeks and a Spring.	2·0	125
Cathro, F. R	Nose Creek	0·75	25
Cameron, D	Millar Creek		115
Darling, A	Carter's Creek.	0·57	40
Deer Creek Cattle Co.	Deer Creek	4·0	362
Dickinson, R. H. & N. S.	"	1·5	202
Drinnan, Dan	McKay Creek.	2 0	367

SCHEDULE of Canals and Ditches constructed and authorized to be constructed up to date—*Continued.*

Name.	Source of Supply.	Length of Ditch.	Acreage to be Irrigated.
		Miles.	
Elton, C. W. S	Todd Creek	0·6	50
Elliott, F. & Co	Spring Creek	1·75	256
Findlay & McDougall	Highwood River	8·5	4,743
Fraser & McKinnon	North Fork, Sheep River	1·1	315
Fisher, Joseph	" "	1·75	375
Furman, John	Lake	1·15	25
Ford, H. C. & C. E.	South Fork, Fish Creek	1·25	310
Fisher, Barnes, *et al*	South Branch, Sheep River	12·50	1,218
Ford, James	Three Spring Creeks	2·4	486
Fornfeist, Julius	Spring Creek	0·75	120
Fidler Bros	Boundary Creek	1·7	109
Fawcett, Chas. W	Fish Creek		15
Gardner, Meopham	Small Creek	2·3	360
Glengarry Ranche Co	North Fork, Trout Creek	2·85	473
George, Bros	Beaver Creek	1·9	400
Godsal, F. W	South Fork, Oldman River	0·8	280
Gornall & Taylor	North Fork, Sheep River	1·0	120
Greig, G	Spring Creek	1·60	163
Grant, J. A	Creek	1·5	145
Gardiner, W. C	"	0·75	116
Hull, W. R	Nanton Creek	1·2	105
Houk, George	St. Mary River	0·75	88
Hunter, Wm	Fish Creek	1·20	81
Herring, Bland	Waterton River	2·75	1,855
Hull, W. R	Spring Creek	0·75	93
Hull, W. R	Nanton Creek and Spring Creek	2·0	110
Hull, W. R	Oxley Creek	3·2	570
Hamilton & Parslow	Spring Creek and Nose Creek	1·25	100
Hull, W. R	Oxley Creek	0·85	110
Hargrave, J., J. C., & T. A	McKay Creek	2·5	975
Hargrave, J., J. C., & T. A	"		1,270
Harrington, E. L	Spring Creek	0·60	53
Hutchinson, W	"	0·42	23
Henry, T. A	Little Bow River	2·75	134
Hooper & Huckvale	Manyberries Creek	4·5	1,295
Indian Department	Bow River	8·5	2,200
Imes, J. W	Red Deer River	6·75	5,935
Johnson, E	Spring Creek	1·75	300
Jamieson, A. P	North Fork, Fish Creek	1·25	130
Jones, Herbert	Spring Creek		130
Kerfoot & Meiklejohn	Coal Creek and Grand Valley Creek	5·3	580
Kane, Bridget	Spring Creek	0·7	43
Lott, H. S	Elbow River and Creek	2·55	365
Lachance, Patterson & Smith	Belly River	3·4	1,440
Lees, W. R	Mill Creek	0·7	191
Lane, George & Co	Kuntz Creek	2·25	638
Lineham, J	Macabee Creek	1·7	252
Lyndon, C. A., & W	North Branch, Trout Creek	1·7	160
Little Bow Cattle Co	Mosquito Creek	3·2	458
Law, John	Todd Creek	0·5	90
Lineham, J	Macabee Creek	4·03	226
Little Bow Cattle Ranche Co	Creek	1·5	172
May, E. G., (Estate of)	"	1·0	103
Miller, Adams & King	Spring Creek	1·1	165
Middleton, H. S	Sullivan Creek	1·1	93
Milk River Cattle Co	Coulee	0·75	45
McLachlan, J. W	Highwood River	3·8	680
McDonald & Sherbourne	South Fork, Sheep River	4·25	799
McLean, A. J	Todd Creek	0 88	200
McNab, W. H., & J	Coulee	1·50	340
McDermid, M	Spring Creek	1·25	119
McEwan, J. H	Four-Spring Creeks	3·5	230
McDonald, Donald	Two-Spring Creeks and Willow Creek	1·5	100
McCann, P. H	North Fork, Medicine Coulee	1·0	300
Nelson, John	North Fork, Oldman River	1·0	180

SCHEDULE of Canals and Ditches constructed and authorized to be constructed up to date—*Continued.*

Name.	Source of Supply.	Length of Ditch.	Acreage to be Irrigated.
		Miles.	
Neame, A.	North Fork, Sheep River	....	90
Nicholson, A.	Middle Fork, Medicine Coulee	1·75	350
Ockley, J. W.	South Fork, Fish Creek	0·8	110
Owens, John	Lake	2·4	82
Payne, W	Mahmee Creek	0·55	37
Pruitt, L. H	Lost River	1·00	250
Paige, F. K.	Fish Creek	1·4	82
Paige, F. K.	"	....	250
Playle, A. H.	Playle Creek	1·8	165
Patterson, J. D.	A Creek	....	170
Quirk, John	North Fork, Sheep River	2·75	300
Quail, W. H	Spring Creek, Trout Creek	1·8	30
Quail, W. H.	Muddypound Creek	4·25	558
Quirk, John	Three-Spring Creeks	3·0	534
Reesor, W. S	A Coulee	1·75	90
Russell, G. F.	Pothole Creek	1·5	80
Ross, J. F., & McLean, J. A.	Ross Creek	2·75	580
Roth, R. L.	Medicine Coulee	....	145
Rowland, A. W.	Sheep River	4·75	380
Robertson, Mrs. T. W	Highwood River	4·3	1,265
Rea, J. R.	Sorrel Horse Creek	1·0	120
R. N. W. M. Police.	Waterton River	2·0	120
Riley, D. E.	Spring Creek	....	65
Riley, D. E.	Spring Creeks	....	85
Shea & Madden	Beaver Dam Creek	2·5	249
Smith & Tee	Highwood River	2·3	263
Skrine, W. C.	Mosquito Creek	0·6	26
Short, J. W	Subsid. Channel of Highwood River.	2·0	240
Sharples, C	Trout Creek	1·0	400
Shaw, Mrs. Helen	Fish Creek	0·25	18
Sheepy, Joseph.	Swamp	0·55	30
Stewart, W. R	Spring Creek	0·51	139
Stevenson, J. & W.	Trout Creek	2·4	549
Stevenson, R. & A.	Muddypound Creek	4·0	380
Smith, Dr. Allison	Two Coulees	3·2	560
Stone, F. A.	A Spring	....	76
Southern Alberta Land Co	Bow and Belly Rivers Forty-Mile Coulee and Seven-Persons Creek	....	95,143
Starks & Burton	Bullshead Creek	1·7	240
Stanton, Richard	Spring	Dam only.	40
Springbank Irrigation District.	Jumpingpound Creek	35·5	30,776
Turner, Robert	North Fork, Sheep River	1·25	145
Thibaudeau, J. B.	Indian Farm Creek	1·10	200
Taylor, Howard	Medicine Coulee	1·0	120
Vebaree Ranche Co.	A Spring Creek	0·75	138
Vebaree Ranche Co. & J. S. Blake	A Creek	1·25	215
Vaughn, W. R.	A Lake, and Rolph Creek	1·57	465
Walsh, R. jr. & sr.	Beaver Dam Creek	2·75	258
Wallace, R. A.	Highwood River	10·0	2,148
Walker, B. G.	Elbow River	1·5	175
Woolf, J. W.	Snake Creek	1·75	216
Wilson, D. E.	Carter's Creek	0·60	50
West, J. N.	Meadow Creek	0·75	120
Wright, Francis	North Fork, Sheep River	....	80
Wright, Francis	Bullshead Creek	0·75	60
Wiley, C. A	Sage Creek	....	240

IRRIGATION DEVELOPMENT IN THE PROVINCE OF SASKATCHEWAN.

SCHEDULE of Canals and Ditches constructed and authorized to be constructed up to date.

Name.	Source of Supply.	Length of Ditch.	Acreage to be Irrigated.
		Miles.	
Armour, Hugh	Qu'Appelle River	0·75	450
Anticknap, H	Coulee	Floods.	5
Axton, J. W. E	South Fork, Swift Current Creek, Spring Coulee	1·75	220
Armstrong & Sons	West Branch Farwell Creek	4·5	790
Brannif, D	Bear Creek	0·6	220
Bertram & McCarthy	Skull Creek	1·7	50
Binger & Kerr	Qu'Appelle River	0·25	344
Benson, Gunder	Two Spring Creeks	1·75	230
Baloovski & Wodlinger	Bridge Creek	1·7	200
Badger, H. J	Battle Creek	1·0	100
Barroby, Frank	Creek	1·5	200
Bolton, M. C. & A. M	Frenchman Creek	2·2	315
Bolingbroke, J. E	Spring Creek	0·15	50
Butler, C. R	Davis Creek and Spring Creek	2·85	400
Beveridge, D	Piapot Creek		40
Canadian Land and Ranche Co.	Rush Lake Creek	3·12	777
Canadian Land and Ranche Co.	Skull Creek	2·5	930
Canadian Land and Ranche Co	Bridge (or Dirt) Creek		120
Cumberland, A	Piapot Creek	0·3	50
Cross, A. M	Calf Creek	1·5	100
Cruickshank, R	Rush Lake Creek	1·7	175
Conrad-Price Cattle Co	Maple Creek	4·5	979
Conrad-Price Cattle Co.	"	3·7	1,046
Cross, Frank	Little Frenchman Creek	1·0	135
Cheeseman, Ben	Coulee	1·0	245
Dixon, J. & I	Maple Creek	3·0	55
Dunlap, R. J	Spring Creek	2·1	535
Duncan, A. S	Frenchman Creek	2·2	350
Dixon & Williams	Maple Creek	3·4	1,108
Enright & Strong	Frenchman Creek	4·5	2,972
Fearon & Moorhead	Piapot Creek	3·0	500
Fauquier, H. H	Hay Creek	1·1	50
Fearon, Edward	Spring Creek and Piapot Creek	2·0	320
Flowerday, H. B	North Fork, Medicine Coulee	0·75	80
Fordice, E. S	Warlodge Creek	1·25	130
Freel, W. B	Frenchman Creek		100
Greeley, Marsh *et al*	Belanger Creek	6·0	330
Greeley, H. A	Maple Creek	0·8	110
Giclais, C. M. de la	Doyle's Spring Creek	1·5	60
Gaff, J. A	Battle Creek	2·6	860
Goodwin, Frank	Coulee	0·75	85
Graham, W	North Fork, Medicine Coulee	2·7	485
Gilchrist, R. P. & W. F	Battle Creek	2 0	175
Hammond, G. R	South Fork, Hay Creek	0·9	25
Hudson's Bay Co	Jackfish Creek	0·4	79
Hewitt, S. W	Spring Creek	1·5	125
Halston, J	Spring Creek & Dip Creek	1 25	97
Huntley, A. L	Spring Creek	0·8	80
Huntley, Joseph	Mink Creek	0·75	80
Haydock, F. C	Sheep Creek	0·25	20
Hewitt, S. W	Lone Pine Creek	1·5	100
Henry, F. W	Battle Creek	2·0	360
Herman, D. M	Frenchman Creek		180
Jones & Webster	Miry Creek	3·5	390
Jones, H. S	Chimney Coulee and Spring Creek	0·85	95
Jones, H. Y	Spring	1·0	83
Jahn, B. A	Medicine Coulee	0·75	90
Jones & Smart	Two Springs	1·50	200
Lawson, H. C	Qu'Appelle River	0·5	320
Lindner, J	Battle Creek	1·60	200
Lewis, C. L	Swift Current Creek	1·7	100
Lynch, M	Medicine Coulee		250
Marshall, H	Battle Creek	1·5	280

SCHEDULE of Canals and Ditches constructed and authorized to be constructed up to date—*Concluded.*

Name.	Source of Supply.	Length of Ditch.	Acreage to be Irrigated.
		Miles.	
Maple Creek (Canada) Cattle Co	Cottonwood Creek	1·0	405
Morrison, D.; M.A., & A.A.	Frenchman Creek	3·4	920
Mackinnon Bros	North Fork, Medicine Coulee	3·1	710
Murdock, D. W	Bridge or Dirt Creek	2·7	355
Morrison, G. M	Frenchman Creek	3·7	695
Murray, D	Spring Creek and Ravine	3·0	160
McDougall, D	Qu'Appelle River	0·5	130
McCarthy, A	Rear Creek	0·25	80
McKinnon, J., jr	Battle Creek	3·75	1,260
McDonald, A. P	Lone Pine Creek	1·0	75
McCarthy, McCarthy, *et al*	Bear Creek	3·5	970
McCarthy, A	Glennie's Creek	2·5	345
McArthur, D	Spring Creek	0·85	80
McNicol, W. F	Frenchman Creek	0·75	70
Needham, R. & H.	Bear Creek	3·5	920
Nelson & Reed	Coulee	1·5	400
Peecock, F. W. & R. E	Hay Creek	0·25	125
Peecock, F. W	"	0·25	255
Pollock, D. H	South Fork, Swift Current Creek	0·5	280
Pearse, S	Creek	2·0	220
Potter, E. S. & L. B	Frenchman Creek	3·0	345
Peecock, F. W. & R. E	Hay Creek	0·75	380
Paul, Leonard	Spring Creek	1·5	60
Rose, B. E	Lake	0·75	128
Richardson, Mrs. L. E	Battle Creek	8·0	1,380
Richardson, Henry	Creek	1·25	265
Recsor, D. H. P	Battle Creek	3·5	650
Spangler, J. M	Six-Mile Coulee	2·5	290
Sanders, C. W. (late) Fauquier, H. H. (executor)	Sheep Creek	1·2	180
Smart, J. L	Two-Spring Creeks	1·0	180
Smart, J. L	A Spring Creek		74
Smith, S. A	South, Fork, Swift Current Creek	1·95	100
Smith, G. G	Spring Creek	1·7	181
Small, W	McShane Creek	1·12	150
Tenaille, D	Frenchman Creek	0·75	100
Wood & Anderson	Coulee	2·7	240
Wood & Anderson	Spring Creek	0·75	50
Wilson, W. S	Battle Creek	2·5	435
Will, T. L	Jackpot Creek	2·5	320
Watson, G. F. & E. A	Frenchman Creek	2·0	720
Wright, B. C	Davis Creek		190
Wyatt, F	Two-Spring Creeks		185

THE ALBERTA RAILWAY AND IRRIGATION COMPANY'S CANAL.

This canal was first started as the Canadian North West Irrigation Company, about nine years ago, and takes the water from the St. Mary River, in Township 1, Range 25, west of the 4th meridian. From this point the canal runs in a northeasterly direction to the country lying east of Lethbridge. The Company subsequently changed the name to the Alberta Railway and Irrigation Company, and the work accomplished by this Company marks the first step in successful irrigation on a large scale in the semi-arid region. The area of land in the Company's original scheme was 500,000 acres and has lately been extended to include 500,000 acres more, and for the purpose of irrigating this additional area the Company have extended and enlarged their canal system, as well as building a new canal to take water from Milk River to irrigate a portion of this additional tract. The canals constructed by the Company comprise a total length of over 100 miles besides some 30 miles of natural channels used by them, and the expenditure by this Company up to the present time is something over one million dollars, and when their scheme is completed it will have cost about a million and a quarter.

The development of this canal system has resulted in the settlement of the lands all the way from the point of intake to Lethbridge and east thereof, and there are now three good sized towns, one of which (the Town of Raymond) has a beet root sugar factory, which cost half a million dollars and which in the year 1906 used 32,920 tons of beets grown in the district, for which an average price of $5 per ton was paid. When the Company began operations on the construction of the canal there were no settlements along the line of the canal and the land was considered only fit for grazing purposes, where to-day this same land is producing the best red winter wheat in the Province, besides all other kinds of crops. For the benefit of this section of country the Company built a railway from Lethbridge to Cardston, running through all the towns. This railway not only hauls out the wheat and grain of the district but hauls the beets to the sugar factory at Raymond, at a very cheap rate, which is a great convenience to the farmers of this district.

At the different towns along this line of railway, elevators have been built as well as flour mills.

THE ENRIGHT AND STRONG DITCH.

This ditch takes the water from the Frenchman River, in Saskatchewan, and is one of the largest ditches built by private individuals for irrigating their own lands. The ditch is about nine miles in length, and will irrigate about 3,000 acres of land in the valley of the Frenchman River. The ditch is well constructed; in fact the scheme all through is a model one to be built by private enterprise.

*THE FEARON, MOORHEAD AND HASTIE DITCH.

This ditch will take water from Skull Creek and Dirt or Thirty-two Mile Creek, and will use several small sloughs as reservoirs. There will be on this scheme a concrete pipe about 1,000 feet long in the form of an inverted syphon; also a tunnel about 400 feet long, taking water from a reservoir. This ditch when completed will irrigate about 2,000 acres of land, and will be twenty-six miles long.

THE CANADIAN PACIFIC RAILWAY IRRIGATION PROJECT.

This irrigation scheme comprises a block of three million acres situated east of Calgary along the main line of the Company's railway. The block is bounded on the west by the fifth meridian, on the south by Bow River, on the east by the line between Ranges 10 and 11, west of the fourth meridian, and on the north by the Red Deer River and the north boundary of Townships 28. It has a length east and west of 150 miles and an average width, north and south, of 40 miles.

* Authorization has not yet been granted for the construction of these works.

The water for the irrigation of this block is diverted from Bow River at a point about two miles below the city of Calgary. From there it is carried east through a main canal, 17 miles in length, which is 60 feet wide on the bottom and 120 on top, and carries 10 feet of water. The main canal delivers water to a reservoir for which a natural depression has been utilized and where, by the erection of a dam, a body of water three miles long, half a mile wide and 40 feet deep, has been created. From this reservoir the water is taken out by three secondary canals, A., B. and C., and carried to the different districts which are to be irrigated, these secondary canals having a combined length of about 150 miles. From the secondary canals the water is again taken and distributed in each irrigation district, through a comprehensive system of distribution ditches that brings the water to each 160 acres of land to be irrigated. The combined length of these distributing ditches is about 800 miles.

The block is divided into three sections, Western, Central and Eastern. In the Western section of the irrigation block there will therefore be the following mileage of waterways constructed and maintained by the Company:—

Main canal	17	miles.
Secondary canals, A., B. and C	150	"
Distributing ditches	800	"
	967	"

Besides this there will be several hundred miles of ditches constructed by the farmers. In completing the work in the Western section of the block the following amount of earth will be moved:—

Main canal	2,500,000	cubic yards.
Secondary canals, A., B. and C	5,000,000	"
Distributing ditches	750,000	"
	8,250,000	"

About the same percentage of waterways and excavation will apply to the Central and Eastern sections, and the completed project will therefore stand about as follows:—

Main and secondary canals and distributing ditches	2,900	miles.
Amount of material moved in completing the project	24,750,000	cubic yards.

with an ultimate expenditure on the great undertaking of about $5,000,000.

THE SOUTHERN ALBERTA LAND COMPANY'S IRRIGATION SCHEME.

The lands to be irrigated by this Company are situated west of Medicine Hat, north and south of the Saskatchewan River, and comprise about 370,000 acres. This scheme will be a departure from the ordinary system of irrigating. Not being able to get the water on the land by gravity, the Company intend installing a system of pumps, and will pump the water into reservoirs on the highest level and then take the water over the land in ditches from those reservoirs.

WATER SUPPLY.

In connection with the volume of the water supply in the Provinces of Alberta and Saskatchewan, a system of hydrographic surveys is being carried on each year, which consists of making careful measurements of the discharge of every stream in both Provinces, large and small, which measurements are recorded, and these surveys will be kept up for a period of years in order to get as nearly as possible the average flow of each stream. The following schedule of measurements taken in 1906 will show the work being done in this respect.

HYDROGRAPHIC SURVEYS.

SCHEDULE showing the Discharge of Streams in Southern Alberta, 1906.

Name of Stream.	Point of Measurement.	Measured Discharge at Low Water.	Measured Discharge at High Water.	Date of Measurement.	Measured by	Remarks.
		Second feet.	Second feet.			
Bow River	4,815 ft. down stream, from mouth of Highwood Riv.	2507·683		Oct. 23, '06	J. F. Hamilton	Low water.
"	596 ft. below C. & E. bridge, Calgary	2138·05		Nov. 1, '06	"	"
"	C.P.R. bridge, 1 mile east of Kananaskis	728·745		Feb. 3, '06	"	Very low water.
Beaver Creek	511 ft. from mouth on Peigan Indian reserve	24·916		July 26, '06	"	
"	S.W. ¼, sec. 2, tp. 9, rg. 29, west 4th meridian	21·3		Aug. 1, '06	P. M. Sauder	
Boundary Creek	S.W. ¼ of sec. 20, tp. 1, rg. 26, west 4th meridian	3·1		Sept. 14, '06	"	
Belly River	Sec. 16, tp. 1, rg. 28, west 4th meridian	131·45		" 20, '06	J. F. Hamilton	Low water.
"	R. N. W. M. P., Big Bend	160·09		" 18, '06	"	
Crownest River	Sec. 29, tp. 7, rg. 1, west 5th meridian, traffic bridge	161·676		Aug. 9, '06	"	
Cottonwood Creek	At Oil City trail	4·1253		Sept. 10, '05	"	
Crooked Creek	Sec. 16, tp. 2, rg. 29, west 4th meridian	8·043		" 3, '06	"	
Cow (or Ross) Creek	Sec. 12, tp. 8, rg. 2, west 5th meridian	2·4		Aug. 4, '06	P. M. Sauder	
Connelly Creek	Sec. 36, tp. 7, rg. 2, west 5th meridian	1·0		" 4, '06	"	
Callum Creek	Sec. 31, tp. 10, rg. 1, west 5th meridian	10·5		" 7, '06	"	
Drywood Creek	Sec. 17, tp. 4, rg. 29, west 4th meridian		225·788	" 27, '06	J. F. Hamilton.,	
"	Sec. 17, tp. 4, rg. 29, west 4th meridian	123·969		" 30, '06	"	
Damon Creek	N.E. ¼ of sec. 12, tp. 11, rg. 2, west 5th meridian	1·0		" 8, '06	P. M. Sauder	
Deer Creek	N.W. ¼ of sec. 15, tp. 1, rg. 12, west 4th meridian	0·5		" 31, '06	"	
Elbow River	959 ft. up stream from Weasel bridge, Sarcee I.R.		1619·04	June 11, '06	J. F. Hamilton	High water.
"	" " " "		728·98	" 18, '06	"	
"	475 ft. east Mission bridge	275·46		Oct. 29, '06	"	Low water.
Fish Creek	Bridge, 1 mile from Midnapore		87·697	June 13, '06	"	
"	110 ft. west of Midnapore		72·539	" 14, '06	"	
"	100 ft. east of "	14·898		Nov. 7, '06	"	
"	Sec. 26, tp. 22, rg. 3, west 5th meridian	42·66		June 16, '06	P. M. Sauder	
" north branch.	Sec. 22, tp. 22, rg. 3, west 5th meridian	29·06		" 13, '06	"	
" south "	" " "	7·51		" 18, '06	"	
Five Mile Creek	150 ft. up stream from bridge, sec. 22, tp. 9, rg. 29, west 4th meridian	7·8		July 31, '06	"	
Highwood River	Bridge, High River, sec. 6, tp. 19, rg. 28, west 4th meridian		1410·689	" 5, '06	J. F. Hamilton	High water.
"	Sec. 1, tp. 8, rg. 2, west 5th meridian		840·99	" 10, '06	"	
"	Near mouth, sec. 22, tp. 21, rg. 28, west 4th meridian.	334·533		Oct. 20, '06	"	Low water.
Heath Creek	Sec. 4, tp. 10, rg. 1, west 5th meridian	5·8		Aug. 6, '06	P. M. Sauder	
Jumping Pound Creek	At bridge, Morley Trail, sec. 30, tp. 24, rg. 4, west 5th meridian	161·89		June 15, '06	J. F. Hamilton	

Jumping Pound Creek	350 ft. down stream from bridge	189·02		June 16, '06	J. F. Hamilton	
Khiskap Creek	Sec. 2, tp. 10, rg. 27, west 4th meridian	2·316		July 30, '06	"	
Lost Creek	Tp. 1, rg. 29, west 4th meridian	11·16		Sept. 7, '06	"	
Lees Creek	In Cardston	19·215		" 21, '06	"	Low water.
"	Sec. 12, tp. 2, rg. 27, west 4th meridian	27·1		" 15, '06	P. M. Sauder	
Lyndon Creek	Sec. 11, tp. 12, rg. 29, west 4th meridian	17·7		July 21, '03	"	
Mosquito Creek	380 ft. down stream from C. & E. bridge	35·55		" 14, '06	J. F. Hamilton	
Muddypound Creek	Sec. 25, tp. 11, rg. 28, west 4th meridian	9·181		" 19, '06	"	
Mill Creek	Sec. 19, tp. 6, rg. 1, west 5th meridian	46·432		Aug. 8, '06	"	
Mahmee Creek	Sec. 19, tp. 2, rg. 27, west 4th meridian	2·97		Sept. 15, '06	"	
Mosquito Creek	S.W. ¼ of sec. 11, tp. 15, rg. 26, west 4th meridian	36·8		July 25, '06	P. M. Sauder	
Milk River	N.E. ¼ of sec. 21, tp. 2, rg. 16, west 4th meridian	19·5		Sept. 5, '06	"	
" S. branch	S.E. ¼ of sec. 1, tp. 1, rg. 20, west 4th meridian	6·1		" 7, '06	"	
" N. branch	S.E. ¼ of sec. 11, tp. 1, rg. 23, west 4th meridian	9·8		" 10, '06	"	
Nine Mile Coulee	S.W. ¼ of sec. 1, tp. 9, rg. 29, west 4th meridian	1·2		Aug. 1, '06	"	
Nanton Creek	Sec. 21, tp. 16, rg. 28, west 4th meridian	21·97		July 14, '06	J. F. Hamilton	
Oldman River, N. Fork	Sec. 34, tp. 7, rg. 1, west 5th meridian		258·82	Aug. 10, '06	"	High water.
Oldman River	Sec. 10, tp. 9, rg. 26, west 4th meridian		1229·64	July 25, '06	"	"
"	" " "		1013·90	" 31, '06	"	"
"	" " "	528·38		Oct. 2, '06	"	Low water.
Oil Creek	Cameron Falls	29·41		Sept. 12, '06	"	
Olson Creek	Sec. 2, tp. 9, rg. 28, west 4th meridian	1·1		July 30, '06	P. M. Sauder	
Olin Creek	Sec. 22, tp. 9, rg. 1, west 5th meridian	1·4		Aug. 6, '06	"	
Oxley Creek	S.W. ¼ of sec. 25, tp. 14, rg. 29, west 4th meridian	13·9		July 7, '06	"	
Pincher Creek	S.W. ¼ of sec. 23, tp. 6, rg. 30, west 4th meridian	6·714		Aug. 13, '06	J. F. Hamilton	
Pekisko Creek	Sec. 25, tp. 17, rg. 2, west 4th meridian	48·17		July 9, '06	"	
Pine Creek	Near Crossing Oil City Trail, tp. 3, rg. 30, west 4th meridian	12·802		Sept. 4, '06	"	
Pass Creek	50 feet up stream from ford, Oil City Trail, tp. 2, rg. 30, west 4th meridian	34·463		" 5, '06	"	
Playle Creek	Sec. 25, tp. 11, rg. 2, west 5th meridian	1·1		Aug. 8, '06	P. M, Sauder	
Sharples Creek	N.E. ¼ of sec. 31, tp. 10, rg. 1, west 5th meridian	3·8		" 7, '06	"	
Sheep River	At C. & E. Ry. Bridge, sec. 21, tp. 20, rg. 29, west 4th meridian		7805·583	June 29, '06	J. F. Hamilton	
"	190 ft. east of above	86·348		Nov. 6, '06	"	
" North Fork	Sec. 7, tp. 21, rg. 2, west 5th meridian	109·619		June 21, '06	"	
Sheep River, N. Fork	Sec. 7, tp. 21, rg. 2, west 5th meridian		593·966	June 23, '06	J. F. Hamilton	
" S. branch	Sec. 17, tp. 20, rg. 2, west 5th meridian		879·031	" 25, '06	"	
" S. Fork	Sec. 2, tp. 7, rg. 1, west 5th meridian, 164 feet North of bridge	270·104		Aug. 11, '06	"	
St. Mary's River	½ mile above intake of A. R. & I. Co's., Canal	508·136		Sept. 22, '06	"	
Stimson Creek	Sec. 25, tp. 17, rg. 2, west 5th meridian	28·81		July 9, '06	"	
Sheep River, S. branch	N. E. ¼ of sec. 6, tp. 20, rg. 2, west 5th meridian		797·78	June 25, '06	P. M. Sauder	
Todd Creek	Sec. 7, tp. 8, rg. 1, west 5th meridian	11·7		Aug. 4, '06	"	
Tennessee Creek	Sec. 23, tp. 8, rg. 30, west 4th meridian	2·7		" 2, '06	"	
Trout Creek	Sec. 2, tp. 12, rg. 29, west 4th meridian		40·4	July 21, '06	"	
Trout Creek, Middle Fork	Sec. 14, tp. 12, rg. 1, west 5th meridian	15·3		" 19, '06	"	
Trout Creek, W. branch of South Fork	Sec. 36, tp. 11, rg. 30, west 4th meridian	5·0		" 20, '06	"	
Trout Creek, S. branch of South branch	" " "	7·1		" 20, '06	"	

SCHEDULE showing the Discharge of Streams in Southern Alberta, 1906—*Continued.*

Name of Stream.	Point of Measurement.	Measured Discharge at Low Water.	Measured Discharge at High Water.	Date of Measurement.	Measured by	Remarks.
		Second feet.	Second feet.			
Trout Creek, Middle branch of South Fork.	Sec. 36, tp. 11, rg. 30, west 4th meridian	4·3		" 20, '06	"	
Trout Creek, S. Fork.	Sec. 6, tp. 12, rg. 29, west 4th meridian	16·8		" 20, '06	"	
Trout Creek	Sec. 12, tp. 12, rg. 29, west 4th meridian		81·59	" 19, '06	J. F. Hamilton	
Tongue Flag Creek	Sec. 19, tp. 19, rg. 28, west 4th meridian	7·30		" 6, '06	"	
Willow Creek	Sec. 7, tp. 12, rg. 27, west 4th meridian		257·969	" 18, '06	"	
"	Sec. 31, tp. 9, rg. 26, west 4th meridian, C. & E. Bridge		262·313	" 22, '06	"	
	300 feet east of above		283·404	" 31, '06	"	
"	C. & E. Railway Bridge, sec. 31, tp. 9, rg. 26, west 4th meridian	169·596		" 30, '06	"	
"	C. & E. Railway Bridge, sec. 31, tp. 9, rg. 26, west 4th meridian	70·913		Oct. 3, '06	"	
Willow Creek	Sec. 7, tp. 12, rg. 27, west 4th meridian		255·2	July, 18, '06	P. M. Sauder	
" "	" " " " "		208·13	" 16, '06	"	
Waterton River	Outlet at Lakes, Sec. 8, tp. 2, rg. 29, west 4th meridian		648·60	Sept. 6, '06	J. F. Hamilton	
" "	Sec. 8, tp. 2, rg. 29, west 4th meridian	442·206		" 10, '06	"	
" "	R. N. W. M. Police detachment	300·22		" 26, '06	"	
Yarrow Creek	Bridge, Oil City Trail, sec. 8, tp. 4, rg. 29, west 4th meridian		526·89	Aug. 25, '06	"	
" "	141 feet down stream from above location	243·83		" 28, '06	"	
" "	" " " " "	121·078		" 30, '06	"	

SCHEDULE showing the Discharge of Streams in Saskatchewan, 1906.

Name of Stream.	Point of Measurement.	Measured Discharge at Low Water.	Measured Discharge at High Water.	Date of Measurement.	Measured by	Remarks.
		Second feet.	Second feet.			
Hay Creek	Sec. 29, tp. 10, rg. 25, west 3rd meridian	8·42		June 30, '06	R. J. Burley	
Maple Creek	Sec. 5, tp. 12, rg. 26, west 3rd meridian	254·00		" 13, '06	"	6500.00 feet, at flood.
Medicine Coulee, Middle Fork.	Near Jahn's house	0·63		Aug. , '06	"	Large flow on high water in spring.
Piapot Creek	Sec. 36, tp. 10, rg. 25, west 3rd meridian	9·86		June 21, '06	"	

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In July last I addressed a circular letter to all irrigators, together with forms to present time only a few irrigators have responded, probably owing to the lateness of

INFORMATION from

Number.	Name.	Location of Lands.			Acreage under Crop.													No. of Irrigations.	Date of Irrigations.	
		Township.	Range.	Meridian.	Wheat.	Barley.	Oats.	Rye.	Peas.	Timothy.	Alfalfa.	Bromus.	Native Grasses.	Potatoes.	Sugar Beet.	Garden Truck.	Total.		First.	Last.
1	Canadian Land & Ranche Co	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
2	Moorhead, Hamilton	10	25	3	.	.	..	..	..	..	..	..	200	..	..	..	200	4	May 3	Aug. 1
3	Fearon, Edward	10	25	3	..	..	..	..	..	..	..	..	200	..	..	..	200	..	" 1	July 27
4	Wallace, R. A	19	28	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
5	Lyndon, W. A	12	29	4	6	..	60	..	..	50	..	15	..	¾	..	..	131¾	5	June	July 16
6	Vebaree Ranche Co	16	1	5	..	..	50	..	..	..	..	..	100	..	..	..	150	..	Oct. 15	..
7	Shaw, Helen	23	1	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
8	Fisher, Joseph	21	3	5	.	..	..	..	..	..	..	..	300	..	..	2	302	..	May	July
9	Payne, William	2	28	4	..	..	..	..	..	25	..	..	..	..	..	..	25	..	Constant.	
10	American Farming Co	8	19	4	..	..	20	9	..	..	..	..	..	..	..	..	29	1	..	..
11	Thibaudeau, J. B	5	29	4	30	..	50	..	..	100	¼	1	618	1½	..	..	800	..	..	..
12	Eckford, A. H	18	29	4	..	..	..	..	..	..	..	20	..	½	..	..	20½	6	May	August
13	Enright & Strong	6	21	3	5	..	176	..	..	..	70	..	..	3	..	6	260	..	July 4	Aug. 20
14	Burn, H. St. G	7	2	5	..	..	16	..	.	13	..	..	..	1	..	½	30½	4	May 21	July 15
15	Huntley, Joseph	7	29	3	4	7	12	..	..	..	..	..	60	½	..	..	83½	1	July	..
16	Cross, A. M	7	22	3	..	..	32	..	..	..	..	..	..	..	..	..	32	1	May	..
17	Hooper & Huckvale	4	6	4	..	..	14	10	..	..	..	..	600	..	..	..	624	2	June	..
18	Harker, Ephraim	2	27	4	..	..	..	..	..	40	..	..	..	..	..	..	40	..	..	..
19	Darling, Adam	22	2	5	..	..	..	..	..	..	..	..	40	..	..	..	40	..	..	..
20	Wright, Francis	11	5	4	10	..	12	..	..	..	..	..	..	6	1	5	34	2	March (last week	July 30
21	Hemelryk, G. E	8	20	4	40	..	10	..	..	..	..	..	..	..	..	..	50	1	Various	..

be filled in by them showing the results obtained from irrigation, but up to the the harvest this season. The following are the results obtained so far.

Irrigators, 1906.

Date of Harvest.			Results.			Remarks
Hay.	Grain.	Vegetables.	Hay.	Grain.	Vegetables.	
			Tons	Bush.	Bush.	
.....	.....	.....	.....	.....	.....	No irrigation required owing to wet season.
.....	.....	.....	200	.....	.....	Though returns look small, there would be absolutely nothing without irrigation.
.....	.....	.....	200	.....	.....	Water not used on grain crops as it was all required for hay lands.
.....	.....	.....	.....	.....	.....	Not found it necessary to use irrigation owing to wet season.
August	Sept.	October	.....	3,610	104	
.....	.....	.....	125	.....	.....	
.....	.....	.....	.....	.....	.....	Rainfall sufficient without irrigation.
Aug. & Sept.	.....	.....	.....	.....	.....	Great improvement to sow clover and timothy in early summer when moistened by irrigation, it improves quantity and quality of the hay.
.....	.....	.....	.....	.....	.....	
.....	Sept.	.....	.....	.....	.....	Much in favour of irrigation; also had 150 acres of flax yielding 100 tons.
August	"	October	.....	.....	500	Native grasses used for pasturage; oats, timothy, bromus and alfalfa cut green for hay, yielding 113 tons.
Aug. 15	.....	Sept. 15	40	.....	75	Bromus cut for hay; also had good results with garden truck.
.....	.....	.....	120	2,600	.....	Winter killed almost nine-tenths of alfalfa. Of oats 120 acres were cut green for hay.
Aug. 15	August	October	33	645	.....	Good yield of timothy hay.
Sept. 15	Sept. 5	"	25½	.....	.....	Wheat, barley and oats cut green; root crop was good; rhubarb was extra fine.
.....	" 15	.....	.....	1,820	.....	Irrigated land before seeding; had 55 tons of oat straw.
.....	.....	.....	327	.....	.....	We made three blades of grass grow where only one grew before irrigation on a large area; timothy not cut, it is used for pasture.
.....	.....	.....	.....	.....	.....	Irrigation not necessary this season.
.....	.....	.....	.....	.....	.....	My experience is that land irrigated yields twice as much of the class of hay I raise as land which is not irrigated.
.....	Aug. 8	October	.....	840	1,892	Also had 14 tons of sugar beets, 12 tons fodder roots, 10 tons cabbage, 12 tons of field corn, and good results with garden truck. The wheat and oat lands were irrigated before seeding, when top-dry enough a light harrow was run over and seed sown broadcast, every seed seemed to have germinated. Wheat, when harvested, was 48 inches high, while wheat alongside on unirrigated land dried out and was a complete failure. The potato land was flooded before planting and irrigated once in July, potatoes were put in rows 300 yards long, and when raised there were 6 bushels more to the row than other rows that were not irrigated—meaning $5 more profit per row. Garden truck, where irrigated, was splendid, but dried out and was a failure in places where the water could not reach it.
Aug. & Sept.	August	.....	20	800	....	Oats were cut green; where land was irrigated yield was considerably over 2 tons of hay to the acre. On the spring wheat land there were a few parts not irrigated, and on these parts the yield was very light.

HYDROGRAPHIC SURVEYS.

SCHEDULE showing the Discharge of Streams in Southern Alberta, 1906.

Name of Stream.	Point of Measurement.	Measured Discharge at Low Water.	Measured Discharge at High Water.	Date of Measurement.	Measured by	Remarks.
		Second feet.	Second feet.			
Bow River	4,815 ft. down stream, from mouth of Highwood Riv.	2507·683		Oct. 23, '06	J. F. Hamilton	Low water.
"	596 ft. below C. & E. bridge, Calgary	2138·05		Nov. 1, '06	"	"
"	C.P.R. bridge, 1 mile east of Kananaskis	728·745		Feb. 3, '06	"	Very low water.
Beaver Creek	511 ft. from mouth on Peigan Indian reserve	24·916		July 26, '06	"	
"	S.W. ¼, sec. 2, tp. 9, rg. 29, west 4th meridian	21·3		Aug. 1, '06	P. M. Sauder	
Boundary Creek	S.W. ¼ of sec. 20, tp. 1, rg. 26, west 4th meridian	3·1		Sept. 14, '06	"	
Belly River	Sec. 16, tp. 1, rg. 28, west 4th meridian	131·45		" 20, '06	J. F. Hamilton	Low water.
"	R. N. W. M. P., Big Bend	160·09		" 18, '06	"	
Crownest River	Sec. 29, tp. 7, rg. 1, west 5th meridian, traffic bridge	161·676		Aug. 9, '06	"	
Cottonwood Creek	At Oil City trail	4·1253		Sept. 10, '06	"	
Crooked Creek	Sec. 16, tp. 2, rg. 29, west 4th meridian	8·043		" 3, '06	"	
Cow (or Ross) Creek	Sec. 12, tp. 8, rg. 2, west 5th meridian	2·4		Aug. 4, '06	P. M. Sauder	
Connelly Creek	Sec. 36, tp. 7, rg. 2, west 5th meridian	1·0		" 4, '06	"	
Callum Creek	Sec. 31, tp. 10, rg. 1, west 5th meridian	10·5		" 7, '06	"	
Drywood Creek	Sec. 17, tp. 4, rg. 29, west 4th meridian		225·788	" 27, '06	J. F. Hamilton,	
"	Sec. 17, tp. 4, rg. 29, west 4th meridian	123·969		" 30, '06	"	
Damon Creek	N.E. ¼ of sec. 12, tp. 11, rg. 2, west 5th meridian	1·0		" 8, '06	P. M. Sauder	
Deer Creek	N.W. ¼ of sec. 15, tp. 1, rg. 12, west 4th meridian	0·5		" 31, '06	"	
Elbow River	959 ft. up stream from Weasel bridge, Sarcee I.R.		1619·04	June 11, '06	J. F. Hamilton	High water.
"	" " " "		728·98	" 18, '06	"	
"	475 ft. east Mission bridge	275·46		Oct. 29, '06	"	Low water.
Fish Creek	Bridge, 1 mile from Midnapore		87·697	June 13, '06	"	
"	110 ft. west of Midnapore		72·539	" 14, '06	"	
"	100 ft. east of "	14·898		Nov. 7, '06	"	
"	Sec. 26, tp. 22, rg. 3, west 5th meridian	42 66		June 16, '06	P. M. Sauder	
" north branch	Sec. 22, tp. 22, rg. 3, west 5th meridian	29·06		" 18, '06	"	
" south "	" " " "	7·51		" 18, '06	"	
Five Mile Creek	150 ft. up stream from bridge, sec. 22, tp. 9, rg. 29, west 4th meridian	7·8		July 31, '06	"	
Highwood River	Bridge, High River, sec. 6, tp. 19, rg. 28, west 4th meridian		1410·689	" 5, '06	J. F. Hamilton	High water.
"	Sec. 1, tp. 8, rg. 2, west 5th meridian		840·99	" 10, '06	"	
"	Near mouth, sec. 22, tp. 21, rg. 28, west 4th meridian.	334·533		Oct. 20, '06	"	Low water.
Heath Creek	Sec. 4, tp. 10, rg. 1, west 5th meridian	5·8		Aug. 6, '06	P. M. Sauder	
Jumping Pound Creek	At bridge, Morley Trail, sec. 30, tp. 24, rg. 4, west 5th meridian	161·89		June 15, '06	J. F. Hamilton	

Jumping Pound Creek	350 ft. down stream from bridge	189·02		June 16, '06	J. F. Hamilton	
Khiskap Creek	Sec. 2, tp. 10, rg. 27, west 4th meridian	2·316		July 30, '06	"	
Lost Creek	Tp. 1, rg. 29, west 4th meridian	11·16		Sept. 7, '06	"	
Lees Creek	In Cardston	19·215		" 21, '06	"	Low water.
"	Sec. 12, tp. 2, rg. 27, west 4th meridian	27·1		" 15, '06	P. M. Sauder	
Lyndon Creek	Sec. 11, tp. 12, rg. 29, west 4th meridian	17·7		July 21, '03	"	
Mosquito Creek	380 ft. down stream from C. & E. bridge	35·55		" 14, '06	J. F. Hamilton	
Muddypound Creek	Sec. 25, tp. 11, rg. 28, west 4th meridian	9·181		" 19, '06	"	
Mill Creek	Sec. 19, tp. 6, rg. 1, west 5th meridian	46·432		Aug. 8, '06	"	
Mahmee Creek	Sec. 19, tp. 2, rg. 27, west 4th meridian	2·97		Sept. 15, '06	"	
Mosquito Creek	S.W. ¼ of sec. 11, tp. 15, rg. 26, west 4th meridian	36·8		July 25, '06	P. M. Sauder	
Milk River	N.E. ¼ of sec. 21, tp. 2, rg. 16, west 4th meridian	19·5		Sept. 5, '06	"	
" S. branch	S.E. ¼ of sec. 1, tp. 1, rg. 20, west 4th meridian	6·1		" 7, '06	"	
" N. branch	S.E. ¼ of sec. 11, tp. 1, rg. 23, west 4th meridian	9·8		" 10, '06	"	
Nine Mile Coulee	S.W. ¼ of sec. 1, tp. 9, rg. 29, west 4th meridian	1·2		Aug. 1, '06	"	
Nanton Creek	Sec. 21, tp. 16, rg. 28, west 4th meridian	21·97		July 14, '06	J. F. Hamilton	
Oldman River, N. Fork	Sec. 34, tp. 7, rg. 1, west 5th meridian		258·82	Aug. 10, '06	"	High water.
Oldman River	Sec. 10, tp. 9, rg. 26, west 4th meridian		1229·64	July 25, '06	"	"
"	" "		1013·90	" 31, '06	"	"
"	" "	528·38		Oct. 2, '06	"	Low water.
Oil Creek	Cameron Falls	29·41		Sept. 12, '06	"	
Olson Creek	Sec. 2, tp. 9, rg. 28, west 4th meridian	1·1		July 30, '06	P. M. Sauder	
Olin Creek	Sec. 22, tp. 9, rg. 1, west 5th meridian	1·4		Aug. 6, '06	"	
Oxley Creek	S.W. ¼ of sec. 25, tp. 14, rg. 29, west 4th meridian	13·9		July 7, '06	"	
Pincher Creek	S.W. ¼ of sec. 23, tp. 6, rg. 30, west 4th meridian	6·714		Aug. 13, '06	J. F. Hamilton	
Pekisko Creek	Sec. 25, tp. 17, rg. 2, west 4th meridian	48·17		July 9, '06	"	
Pine Creek	Near Crossing Oil City Trail, tp. 3, rg. 30, west 4th meridian	12·802		Sept. 4, '06	"	
Pass Creek	50 feet up stream from ford, Oil City Trail, tp. 2, rg. 30, west 4th meridian	34·463		" 5, '06	"	
Playle Creek	Sec. 25, tp. 11, rg. 2, west 5th meridian	1·1		Aug. 8, '06	P. M, Sauder	
Sharples Creek	N.E. ¼ of sec. 31, tp. 10, rg. 1, west 5th meridian	3·8		" 7, '06	"	
Sheep River	At C. & E. Ry. Bridge, sec. 21, tp. 20, rg. 29, west 4th meridian		7805·583	June 29, '06	J. F. Hamilton	
"	190 ft. east of above	86·348		Nov. 6, '06	"	
" North Fork	Sec. 7, tp. 21, rg. 2, west 5th meridian	109·619		June 21, '06	"	
Sheep River, N. Fork	Sec. 7, tp. 21, rg. 2, west 5th meridian		593·966	June 23, '06	J. F. Hamilton	
" S. branch	Sec. 17, tp. 20, rg. 2, west 5th meridian		879·031	" 25, '06	"	
" S. Fork	Sec. 2, tp. 7, rg. 1, west 5th meridian, 164 feet North of bridge	270·104		Aug. 11, '06	"	
St. Mary's River	½ mile above intake of A. R. & I. Co's., Canal	508·136		Sept. 22, '06	"	
Stimson Creek	Sec. 25, tp. 17, rg. 2, west 5th meridian	28·81		July 9, '06	"	
Sheep River, S. branch	N. E. ¼ of sec. 6, tp. 20, rg. 2, west 5th meridian		797·78	June 25, '06	P. M. Sauder	
Todd Creek	Sec. 7, tp. 8, rg. 1, west 5th meridian	11·7		Aug. 4, '06	"	
Tennessee Creek	Sec. 23, tp. 8, rg. 30, west 4th meridian	2·7		" 2, '06	"	
Trout Creek	Sec. 2, tp. 12, rg. 29, west 4th meridian		40·4	July 21, '06	"	
Trout Creek, Middle Fork	Sec. 14, tp. 12, rg. 1, west 5th meridian	15·3		" 19, '06	"	
Trout Creek, W. branch of South Fork	Sec. 36, tp. 11, rg. 30, west 4th meridian	5·0		" 20, '06	"	
Trout Creek, S. branch of South branch	" " "	7·1		" 20, '06	"	

SUGAR BEETS GROWN IN SOUTHERN ALBERTA.

The sugar factory being situated at Raymond, the sugar beets are mostly grown in that locality. The acreage for 1906 is about as follows:—

	Acres.
At Stirling	170
At Raymond	2,400
At Magrath	600
At Nine Mile Coulee	112
At Cardston	10
	3,292

The average yield per acre is placed at ten tons, which is considered a low average. This would equal 32,920 tons, and the price paid the farmers was $5 per ton, at the factory. It is claimed that each ton of beets will produce 240 pounds of sugar; with good cultivation, combined with irrigation, it is claimed that as high as 20 tons of beets can be grown per acre. The sugar beet is about as profitable a crop as can be grown with irrigation and has been so profitable in the past couple of years that more will be grown each year. At the present time the scarcity of labour in handling the beets in the fall is against the growing of large quantities, as each farmer will only grow what he thinks he can safely handle.

RESERVOIRS FOR STORAGE PURPOSES.

The development of a water supply for irrigation in the semi-arid region will sooner or later reach a stage where the construction of storage reservoirs becomes a necessity. Where the stream is one of considerable volume numerous irrigation canals will be constructed from it at all convenient points and its entire normal flow will be utilized. Then the necessity for storage reservoirs will become apparent. But with the varying seasons there will occasionally come a year when the best of streams is so shrunken below the normal as to limit the area which can be irrigated from it and emphasize the regret that some means had not been provided for holding back the wealth of water which at times pours to waste without benefit to anyone, so as to render it available in the drier part of the year. Other streams there are which drain large areas and at certain times of the year are formidable and unpassable rivers, that in the summer and fall are practically dry. If these sources are to be rendered serviceable, storage reservoirs must be built as the initial step in irrigation development. All streams, except they be regulated by nature, by means of lakes or subterranean reservoirs, are subject to great fluctuation, and it is the function of artificial reservoirs to equalize in a measure these variations in flow, impounding the floods for use in the seasons when irrigation is necessary. Inasmuch as the total available water supply of the semi-arid region is vastly short of the quantity needed for irrigating all the land requiring irrigation, it is evident that, under every condition and with every class of stream, storage reservoirs are needed to develop the fullest measure of usefulness of the existing supply. Unfortunately it is beyond the possibility of hope that all the water flowing can be stored or utilized. There is such a wide range in the total run-off of every stream from one season to another that it would rarely be possible to find storage capacity for the extremes of flow.

That storage reservoirs are necessary and indispensable adjuncts to irrigation development requires no argument to prove. On the larger streams it is evident that such storage reservoirs will have to be constructed, owned and controlled by the Government, as private capital would not likely be found for such undertakings. In

SCHEDULE showing the Discharge of Streams in Saskatchewan, 1906.

Name of Stream.	Point of Measurement.	Measured Discharge at Low Water.	Measured Discharge at High Water.	Date of Measurement.	Measured by	Remarks.
		Second feet.	Second feet.			
Hay Creek	Sec. 29, tp. 10, rg. 25, west 3rd meridian	8·42		June 30, '06	R. J. Burley	
Maple Creek	Sec. 5, tp. 12, rg. 26, west 3rd meridian	254·00		" 13, '06	"	6500.00 feet, at flood.
Medicine Coulee, Middle Fork.	Near Jahn's house	0·63		Aug. , '06	"	Large flow on high water in spring.
Piapot Creek	Sec. 36, tp. 10, rg. 25, west 3rd meridian	9·86		June 21, '06	"	

10221—2

ELEVATIONS OF VARIOUS POINTS THROUGHOUT ALBERTA AND SASKATCHEWAN.

	Elevation in feet above sea level.
Milk River—	
At International Boundary	2,600
At Alberta Railway and Coal Company's railway bridge	3,401
At confluence of north and south branches	3,512
At International Boundary	4,145
Oldman River—	
Near confluence with Belly River	2,852
At Macleod	3,376
At exit from Mountains	4,437
Red Deer River—	
At confluence with South Saskatchewan River	1,892
At Canadian Pacific Railway (Edmonton Branch) bridge	2,773
At source	6,660
Saskatchewan River—	
Lake Winnipeg	710
Cedar Lake	828
At confluence with South Saskatchewan River	1,250
At Prince Albert	1,360
At mouth of Battle River	1,500
At Edmonton	1,995
Sheep River—	
Near confluence with Highwood River	3,222
At Highway Bridge, Okotoks	3,438
South Saskatchewan River—	
At confluence with Saskatchewan River	1,250
At Saskatoon	1,538
At confluence with Red Deer River	1,892
At Medicine Hat	2,137
At confluence with Bow and Belly Rivers	2,212
St. Mary River—	
At confluence with Belly River	2,729
At Canadian Pacific Railway (Crow's Nest Branch) bridge	2,739
At confluence with Lees Creek	3,625
At International Boundary	4,127
Waterton River—	
Near confluence with Belly River	3,147
Waterton Lake	4,186
Along the line of Canadian Pacific Railway (Main Line)—	
Winnipeg	757
Portage la Prairie	854
Virden	1,444
Indian Head	1,738
Qu'Appelle	1,747
Broadview	1,960
Regina	1,885
Moosejaw	1,767
Parkbeg	1,982
Chaplin	2,202
Summit of railway on Missouri Couteau	2,282
Swift Current	2,423
Gull Lake	2,562
Crane Lake	2,518

ELEVATIONS OF VARIOUS POINTS THROUGHOUT ALBERTA AND SASKATCHEWAN.

	Elevation in feet above sea level.
Along the line of the Canadian Pacific Railway (Main Line)—*Continued.*	
Maple Creek	2,495
Walsh	2,430
Irvine	2,493
Dunmore Junction	2,308
Medicine Hat	2,171
Langevin	2,495
Tilley	2,462
Gleichen	2,952
Calgary	3,428
Cochrane	3,749
Morley	4,067
Canmore	4,284
Banff	4,521
Summit of Kicking Horse Pass	5,329
Along the line of the Canadian Pacific Railway (Crow's Nest branch)—	
Dunmore Junction	2,308
Montana Junction	3,009
Lethbridge	2,982
Macleod	3,128
Pincher	3,818
Blairmore	4,226
Summit of pass through Rocky Mountains	4,449
Prince Albert Branch—	
Regina	1,885
Craven	1,630
Saskatoon	1,574
Duck Lake	1,645
Prince Albert	1,398
Craven Spur—	
Craven	1,630
End of track	1,606
Pasqua Branch—	
Pasqua Junction	1,872
North Portal	1,944
Edmonton Branch—	
Calgary Junction	3,410
Crossfield	3,622
Red Deer	2,806
Lacombe	2,783
Wetaskiwin	2,480
Strathcona	2,188
Macleod Branch—	
Calgary Junction	3,410
Okotoks	3,439
High River	3,394
West Macleod	3,108
Macleod	3,128

ELEVATIONS OF VARIOUS POINTS THROUGHOUT ALBERTA AND SASKATCHEWAN.

	Elevation in feet above sea level.
Along line of Alberta Railway and Coal Company's Railway—	
Lethbridge	2,982
Montana Junction	3,009
Stirling	3,045
Brunton	3,308
Summit of Milk River on line of railway	3,474
Milk River	3,420
Coutts—International Boundary	3,463
Along line of St. Mary's River Railway—	
Stirling Junction	3,043
Magrath	3,210
Spring Coulee	3,578

REMARKS ON IRRIGATION.

The main purpose of irrigation is to furnish the requisite amount of moisture to cropped soil. One of the first questions which confronts the irrigator is to know how much free water soil should contain in order to produce a vigorous growth. According to United States authorities, the answer, in general terms, is one pound of free water to ten pounds of soil as it is taken from the field. In attempting to find out how much free moisture cropped soil should contain, it is well to bear in mind the fact that, while moisture is the principal element in growing crops, it is not the only essential. There are temperature, winds, sunshine, fogs, disease and a lack of air in the soil, which very frequently affect crops; therefore when a crop is suffering an effort should be made to discover the cause, and not jump to the conclusion that more water is required.

The effect of the proper use of water, however, will soon be apparent in the yield of crops and the fertility of the soil. It should be understood from the start that irrigation water cannot take the place of cultivation. The labour and skill of the farmer are needed even more in an arid, than in a humid, climate. Excellent crops of all kinds can be grown with a medium amount of water, provided the soil is well cultivated and the water rightly applied. To tickle the ground with a plow and then apply water and expect to grow good crops, is not cultivation by irrigation. The proper system is to put the plow down well and let the air get into the soil, then crops of all kinds can be grown with a medium amount of water.

Then another point is the lack of drainage. If there is no natural drainage, artificial drainage should be resorted to, whereas if there is no under drainage the water applied to the soil brings the ground water to the surface, where it evaporates, leaving the salts to accumulate until all vegetation is destroyed, and the only insurance against this is proper under drainage. Therefore the drainage conditions are equally important with the water supply, and should be looked into with as much care. When there is not good natural drainage it should be supplied artificially.

While good drainage is the only guarantee against these evils, anything which will check the rise of ground water and lessen evaporation will decrease the danger. The two most effective means of accomplishing these ends are economy in the use of water and thorough cultivation, and cultivation makes possible the greatest economy in the use of water.

Too shallow and too frequent irrigation is another source of waste. Wetting the surface and neglecting to cultivate it afterwards may result in the loss, by evaporation, of three-fourths of the water which is applied in this way. For most plants and for all deep-rooted plants in particular, the ground should be so prepared that water

would readily percolate to a considerable depth beneath the surface, and enough water should be applied to moisten the subsoil.

Again, in farming by irrigation thorough and frequent cultivation is of first importance. It not only prevents the escape of large quantities of soil moisture into the air in the form of vapor, but it greatly improves the condition of the soil.

HOW TO LESSEN THE WASTE OF WATER.

Recent investigations have shown that the quantity of water which plants use forms but a small part of that which is diverted from streams for irrigation purposes. Large volumes are lost by absorption and seepage in the channels of canal systems. Similar losses occur in the ditches which supply farms, and a large part of the remainder is wasted in irrigating crops.

The farmer is chiefly concerned in lessening the waste of water in his supply ditches and on his farm. In localities where water is scarce, the supply ditches should be made water-tight. This may be done by lining the channel with cement concrete, cement plaster, asphalt, heavy crude oil, or clay puddle. Flumes or pipes may also be used as a substitute for an earthen ditch. One of the most common sources of loss of water is poor preparation of the surface. When the soil is irrigated by flooding from full laterals an uneven surface causes needless waste of water, extra labour in spreading it over the surface, and smaller yields. Another common cause of waste is the lack of attendance. Water is often turned on a portion of a field and permitted to run without attention for hours and even days. On some farms the irrigators look after the water for ten hours and turn it loose for the balance of the day. Under this practice the low places receive too much, the high places little or none, and a large part flows off the field, to the injury of the roads and adjoining farms.

PROPER LOCATION OF DITCHES.

Farm ditches should be located in the right place in the start. It is a mistake to build ditches for the lower part of a farm, and in after years when there is a desire to irrigate the remainder to be obliged to build a second series of ditches for the higher land. Sufficient water should first be conveyed from the canal or other source of supply to the highest point and from there distributed to the various subdivisions. It often happens that a farm is more or less cut up by ravines and depressions, which intersect or separate fields, and the supply ditches have to be extended across these low places. This is usually done in one of three ways: When the depression is not more than a few feet deep, levees are built on each side; in other cases, flumes are built on grades from side to side, and lastly, the water may be carried across in a concrete pipe laid in the form of an inverted syphon. The earth levee is the cheapest, but it is subject to leaks and washouts for the first few years. The wooden flume answers the purpose fairly well, but it is subject to early decay. The concrete pipe, although dearer in first cost, is really the cheapest in the end, and if properly built will need no repairs.

PREPARATION OF LAND FOR IRRIGATION.

The new settler in an irrigated district seldom appreciates the importance of preparing the surface of fields so that they may be cheaply, easily and properly watered. Crops in an arid climate are, as a rule, good or bad according as they have received the proper amount of water at the right time, and when the ground is left so rough and uneven that water cannot be evenly applied, the effect is shown in a reduced yield. The preparation of the land is a first cost, and if done thoroughly during the first or second year, little expense need be incurred afterwards. The difference in cost between a smooth, well graded field and one which is poorly graded and rough may not exceed $5 per acre, yet this sum is often lost in one season by diminished yields, due to imperfect watering, caused by rough uneven surface. As it takes three tons of water to produce one ton of crop, the necessity for an even surface can readily be seen.

METEOROLOGICAL STATISTICS.

APPENDIX A.

The following tables show the temperature and rainfall recorded at the meteorological observation stations at widely separated points in the semi-arid region. First published in the report on irrigation in 902, they have been brought up to date through the courtesy of R. F. Stupart, Esq., F.R.S.C., Director of Meteorological Service.

Maximum, Minimum and Mean Temperatures at Chaplin, Sask.—Elevation above Sea Level, 2,200 feet.

Year.	January.			February.			March.			April.			May.			June.			July.		
	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1883																					
1884	40·0	43·0	2·3	41·0	—41·0	— 6·2	45·0	—23·0	14·3	70·0	15·0	37·6	85·0	32·0	56·0	100·0	45·0	66·7	85·0	43·0	65·5
1885	35·0	—47·0	— 5·5	45·0	—33·0	— 2·7	49·0	0·0	27·5							97·0	43·0		93·0	48·0	71·2
1886							70·0	—20·0	29·6	75·0	10·0	42·6	96·0	28·0	54·3	95·0	40·0	62·3	110·0	37·0	63·0
1887	25·0	—42·0	—15·2	40·0	—43·0	—12·9	46·0	—22·0	19·4	80·0	10·0	41·6	90·0	30·0	58·0	90·0	45·0	63·6	94·0	52·0	70·0
1888	45·0	—40·0	—10·0	40·0	40·0	7·2	42·0	—20·0	8·7	65·0	0·0	33·4	75·0	35·0	51·1	90·0	40·0	60·2	97·0	56·0	68·0
1889	40·0	—22·0	7·2	50·0	—30·0	11·4	70·0	— 2·0	28·9	70·0	25·0	43·4	75·0	32·0	54·7	98·0	47·0	66·6	99·0	52·0	66·0
1890	40·0	—30·0	— 5·4	47·0	—34·0	— 6·3	50·0	—10·0	17·5	78·0	12·0	41·2	78·0	37·0	51·1	95·0	40·0	66·4	102·0	50·0	70·4
1891	54·0	— 5·0	22·7	15·0	—30·0	—11·1	45·0	—32·0	10·8	81·0	18·0	49·5	90·0	27·0	57·7	80·0	40·0	59·2	86·0	50·0	66·3
1892	37·0	—38·0	0·7	34·0	—20·0	6·8	57·0	— 5·0	20·7	62·0	25·0	38·7	65·0	30·0	42·2	84·0	40·0	63·8			
1893	40·0	—49·0	3·6	34·0	—45·0	— 5·3	50·0	—24·0	10·3	60·0	—10·0	35·3	82·0	27·0	55·3	90·0	38·0	65·3	100·0	40·0	72·2
1894	38·0	—42·0	— 4·9	45·0	—37·0	— 3·4	44·0	— 5·0	21·9	74·0	10·0	41·8	90·0	32·0	54·6	94·0	35·0	63·6	98·0	42·0	62·8
1895	37·0	—37·0	— 9·0	44·0	—34·0	0·3	62·0	—15·0	22·2	78·0	32·0	53·9	79·0	27·0	49·8	90·0	32·0	54·4	102·0	34·0	66·6
1896	43·0	—35·0	— 1·1	43·0	—30·0	13·1	50·0	—10·0	19·6	70·0	18·0	40·0	77·0	35·0	52·1	95·0	37·0	60·8	93·0	35·0	66·9
1897	30·0	—37·0	2·0	25·0	—27·0	4·5	43·0	—43·0	6·9	83·0	18·0	41·3	92·0	27·0	57·2	94·0	37·0	60·0	98·0	42·0	66·0
1898	32·0	—25·0	8·1	45·0	—20·0	8·3	37·0	—30·0	12·9	67·0	— 7·0	37·4	78·0	36·0	56·8	95·0	45·0	68·3	103·0	40·0	67·2
1899	43·0	—32·0	1·8	45·0	—42·0	— 5·8	22·0	—24·0	— 0·6	67·0	—10·0	35·6	75·0	27·0	49·0	84·0	35·0	57·5	102·0	37·0	70·2
1900	47·0	—22·0	14·2	40·0	—33·0	— 5·8	52·0	18·0	20·0	77·0	25·0	54·6	92·0	28·0	61·2	109·0	30·0	62·3	92·0	40·0	65·7
1901	37·0	—32·0	— 0·1	42·0	—25·0	4·8	47·0	—12·0	24·0	78·0	18·0	43·9	92·0	30·0	61·7	80·0	35·0	53·0	93·0	37·0	67·8
1902	45·0	—27·0	13·1	45·0	—30·0	9·2	45·0	—15·0	24·9	62·0	20·0	40·0	89·0	30·0	53·3	87·0	40·0	60·0	90·0	40·0	64·6
1903	30·0	—32·0	— 1·8	42·0	—27·0	4·7	50·0	—20·0	14·9	75·0	10·0	41·6	79·0	24·0	47·7	83·0	45·0	66·6			
1904	45·0	—32·0	6·4	23·0	—35·0	—13·6	40·0	—22·0	8·6	58·0	10·0	37·5	80·0	30·0	45·5						
1905													96·0	32·0	53·1	96·0	44·0	60·7	92·0	58·0	67·0
1906	40·0	—38·0	7·3	42·0	—25·0	9·3	67·0	—28·0	17·3	81·0	16·0	44·7	85·0	17·0	47·1	82·0	37·0	58·7	104·0	37·0	65·8

Maximum, Minimum and Mean Temperatures at Chaplin, Sask.—Elevation above Sea Level, 2,200 feet.— *Continued.*

Year.	August.			September.			October.			November.			December.			Annual.		
	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1883							65·0	22·5	37·6	50·0	—30·0	15·1	45·0	—30·0	7·4	.....	.....	.....
1884	95·0	49·0	65·7	74·0	29·0	48·0	75·0	18·0	39·4	55·0	—12·0	26·2	50·0	—40·0	— 4·6	100·0	—43·0	34·24
1885										65·0	18·0	36·6	50·0	—11·0	20·2	.....	—47·0	.....
1886	95·0	35·0	55·4	90·0	30·0	45·7	78·0	20·0	42·4	50·0	—12·0	18·3	40·0	—32·0	— 0·5	110·0	.....	.....
1887	92·0	40·0	61·8	82·0	36·0	51·9	76·0	5·0	38·2	60·0	—20·0	23·9	45·0	—30·0	7·4	94·0	—43·0	34·97
1888	98·0	45·0	65·1	85·0	44·0	58·9	70·0	24·0	42·3	43·0	4·0	24·1	45·0	7·0	20·7	98·0	—40·0	35·81
1889	90·0	52·0	69·2	92·0	34·0	53·2	80·0	20·0	45·4	62·0	—15·0	25·3	37·0	—17·0	7·6	99·0	—30·0	39·91
1890	97·0	50·0	62·6	89·0	30·0	49·3	62·0	32·0	42·3	62·0	7·0	39·7	60·0	— 5·0	28·8	102·0	—34·0	38·13
1891	85·0	47·0	65·0	84·0	38·0	55·8	64·0	10·0	38·7	65·0	—10·0	20·2	45·0	—27·0	17·8	90·0	—32·0	37·72
1892							82·0	30·0	48·9	54·0	—10·0	21·0	35·0	—22·0	0·0	.....	—38·0	.....
1893	109·0	29·0	84·8	95·0	28·0	54·4	72·0	15·0	39·0	48·0	—38·0	16·5	37·0	—38·0	1·1	109·0	—49·0	34·21
1894	107·0	37·0	68·2	82·0	27·0	52·2	65·0	25·0	42·3	60·0	—23·0	22·5	40·0	—12·0	14·7	107·0	—37·0	37·19
1895	93·0	28·0	59·2	87·0	24·0	47·2	72·0	0·0	39·0	60·0	—15·0	20·6	50·0	—15·0	10·9	102·0	—37·0	34·30
1896	87·0	37·0	57·5	83·0	27·0	49·3	78·0	15·0	39·2	44·0	—40·0	— 1·1	44·0	—20·0	19·0	95·0	—40·0	34·60
1897	100·0	35·0	64·3	83·0	27·0	54·9	78·0	12·0	42·7	68·0	—33·0	14·0	43·0	—37·0	6·2	100·0	—43·0	35·00
1898	93·0	37·0	61·7	82·0	27·0	52·3	70·0	22·0	37·2	50·0	—30·0	19·9	43·0	—23·0	11·9	103·0	—30·0	36·80
1899	82·0	35·0	56·6	78·0	27·0	49·5	72·0	18·0	37·0	64·0	17·0	36·2	50·0	—12·0	13·5	102·0	—42·0	33·13
1900	87·0	38·0	60·1	75·0	24·0	46·4	60·0	25·0	40·1	55·0	—20·0	20·6	40·0	—17·0	16·8	109·0	—33·0	38·02
1901	92·0	37·0	65·3	80·0	25·0	45·8	72·0	18·0	45·2	52·0	— 5·0	25·6	42·0	—33·0	14·4	93·0	—33·0	37·62
1902	92·0	30·0	68·7	77·0	26·0	49·0	75·0	24·0	43·5	52·0	— 8·0	26·2	30·0	—27·0	— 1·9	92·0	—30·0	37·46
1903	84·0	38·0	58·9	78·0	25·0	44·4	68·0	24·0	42·6	70·0	—12·0	28·2	40·0	—24·0	13·5	.....	—32·0	.....
1904																		
1905	94·0	52·0	66·6	78·0	31·0	55·7	79·0	12·0	35·5	61·0	—12·0	28·5	42·0	—12·0	16·4	96·0	.....	.....
1906	99·0	31·0	62·1	89·0	22·0	54·2	75·0	11·0	41·5	58·0	—16·0	21·4	36·0	—27·0	3·4	104·0	—38·0	36·06

Maximum, Minimum and Mean Temperatures at Swift Current, Sask.—Elevation above Sea Level, 2,423 feet.

Year.	January.			February.			March.			April.			May.			June.			July.		
	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1886	36·4	—39·0	— 7·4	69·0	—25·4	18·9	63·0	— 8·6	21·8	75·2	11·2	42·7	86·2	24·0	53·1	94·4	29·2	63·8	106·6	43·4	72·7
1887	37·0	—36·0	— 3·8	50·0	—42·4	— 7·7	56·0	—19·0	23·3	75·0	9·6	39·1	85·4	26·0	51·8	82·6	26·4	58·5	90·0	34·8	64·3
1888	46·4	—40·2	— 6·1	47·0	—24·0	13·0	55·6	—25·6	11·8	70·4	4·4	35·7	73·0	23·4	48·0	88·0	32·0	57·9	94·0	38·0	64·6
1889	38 2	—25·2	9·0	49·2	—30·4	13·2	68·2	—10·0	32·0	78·2	23·6	45·6	85·0	22·2	49·6	96·0	34·0	60·7	86·6	34·6	62·5
1890	37·4	—40·2	— 6·9	42·0	—40·0	— 4·1	46·6	—10·0	19·0	76·4	7·0	38·3	78·2	17·2	49·1	94·4	35·4	62·6	100·6	34·4	68·1
1891	46·0	—25·0	19·2	31·4	—30·0	— 3·1	49·2	—27·4	17·2	79·2	9·2	45.2	92·4	10·4	50·6	80·0	34·6	56·4	86·6	42·6	62·6
1892	45·4	—34·6	6·6	39·4	—24·4	8·7	53·4	— 8·0	23·5	65·6	11·6	35·0	77·4	20·4	45·1	86·0	37·4	58·3	96·4	36·0	63·6
1893	36·2	—46·2	7·3	34·4	—49·8	— 1·6	43·2	—14·0	12·5	56·0	12·8	30·8	78·8	28·0	52·2	87·0	38·6	59·6	96·6	39·0	65·9
1894	44·0	—32·6	2·8	40·4	—27·6	8·4	51·0	—10·0	20·0	78·0	18·0	42·2	89·0	26·0	53·6	91·6	39·4	63·8	101·6	41·0	70·3
1895	38·2	- 30·2	— 3·5	48·0	—34·0	7·0	57·0	—16·0	23·5	77·4	21·0	47·8	84·6	28·0	51·7	93·6	30·0	57·0	98·0	45·0	65·0
1896	50·0	—32·0	6·3	50·0	—22·0	21·6	52·0	— 6·0	20·5	68·0	15·6	39·1	77·8	32·0	50·1	94·0	40·0	63·7	97·0	40·0	69·3
1897	40·0	—40·0	9·6	34·0	—20·0	10·5	40·6	—34·0	8·7	78·6	20·0	43·3	90·0	36·0	58·5	95·0	33·4	61·2	97·5	37·5	65·5
1898	33·0	—12·8	17·2	41·3	—20·0	12·3	41·5	—20·0	13·4	73·0	2·0	36·4	79·5	26·0	52·0	95·0	34·0	59·8	98·5	40·8	66·3
1899	41·0	—33·5	7·1	41·5	—41·5	— 2·5	41·0	—22·5	4·9	67·0	— 5·5	36·2	72·0	22·3	47·5	83·0	33·0	57·9	98·0	44·0	65·9
1900	59·0	—16·5	21·7	40·0	—35·0	4·2	66·0	—16·0	23·1	74·5	23·5	46·7	90·0	28·0	57·5	104·0	32·0	65·8	95·0	40·0	66·6
1901	42·0	—29·0	9·3	44·0	—18·0	9·4	50·0	—12·(	28·2	83·0	17·0	43·5	91·0	23·0	59·7	76·0	33·0	55·2	92·0	43·0	67·5
1902	51·1	—23·0	16·9	42·0	—28·0	13·0	47·0	—12·(	25·4	64·0	16·0	40·0	87·0	30·0	54·8	80·0	33·0	53·5	88·0	41·0	62·7
1903	42·0	—18·0	15·1	38·0	—34·0	10·5	53·0	—20·0	14·8	76·0	15·0	42·3	91·5	13·0	49·3	86·0	35·0	61·7	90·0	43·0	62·6
1904	40·0	—24·0	10·1	35·0	—28·0	— 3·1	39·0	—22·0	11·6	77·0	12·0	38·3	77·0	28·0	51·7	93·0	38·0	60·2	93·0	39·0	65·0
1905	46·0	—25·0	6·2	58·0	—34·0	11·6	66·0	— 2·(	35·4	78·0	8·0	41·1	79·0	26·0	49·2	87·0	32·0	57·7	85·0	48·0	64·3
1906	45·0	—32·0	14·4	30·0	—17·0	17·2	70·0	—19·0	22·9	86·0	15·0	47·7	87·0	24·0	49·9	89·0	40·0	59·8	91·0	38·0	67·9

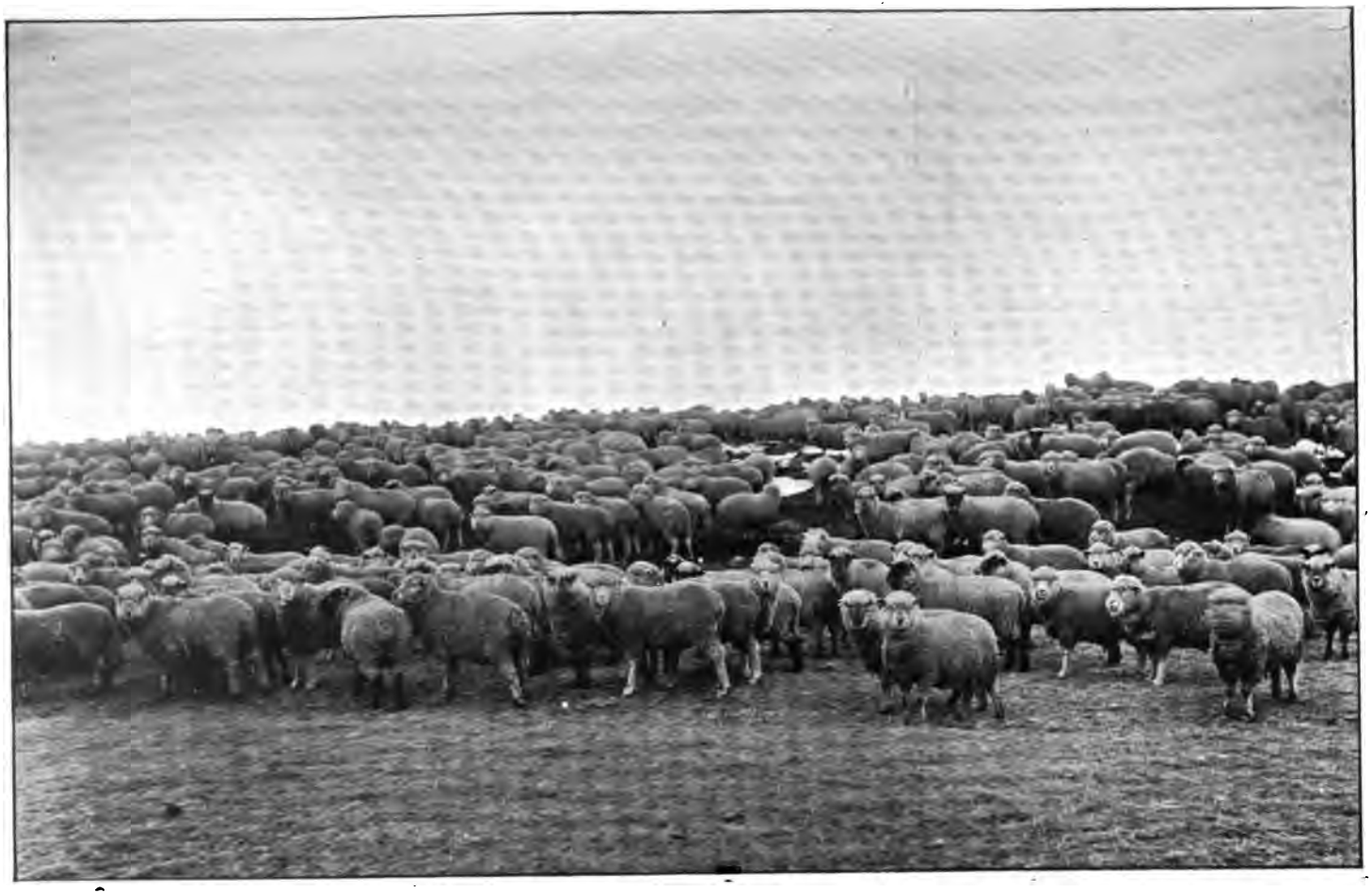
Maximum, Minimum and Mean Temperatures at Swift Current, Sask.—Elevation above Sea Level, 2,423 feet.—*Continued.*

Year.	August.			September.			October.			November.			December.			Annual.		
	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1886	91·6	31·2	64·7	86·0	19·0	49·3	82·0	13·0	41·6	66·0	—12·0	22·7	40·4	—33·0	7·6	106·6	—39·0	37·62
1887	85·4	36·4	59·3	81·4	25·4	53·1	76·4	— 4·0	36·0	67·4	—27·0	23·4	42·4	—30·6	7·0	90·0	—42·4	31·73
1888	95·0	35·4	61·6	86·0	28·0	55·5	77·6	12·0	39·7	48·8	0·4	23·0	58·0	7·0	19·7	95·0	—40·2	35·37
1889	95·7	32·8	65·7	88·6	21·5	50·9	88·7	11·9	42·7	62·0	— 8·0	25·3	48·0	—17·0	11·0	96·0	—30·4	39·02
1890	92·8	35·4	61·0	86·0	16·4	49·3	71·9	22·0	39·1	64·0	3·4	32·5	55·4	— 3·4	24·2	100·6	—40·2	36·02
1891	92·0	34·6	62·2	89·4	30·0	54·1	72·4	9·0	38·8	55·6	—14·0	20·3	43·4	—18·6	17·6	92·4	—30·0	36·76
1892	96·0	40·0	63·3	85·0	30·0	54·0	82·4	16·6	42·4	62·8	—10·0	19·6	32·0	—32·8	7·7	96·4	—34·6	35·90
1893	101·0	35·4	64·6	96·0	18·0	49·9	67·0	13·2	33·9	60·0	—31·0	16·6	41·2	—36·4	13·6	101·0	—49·8	33·78
1894	97·0	42·0	68·3	86·0	26·0	50·6	74·0	20·0	38·0	63·4	—13·0	22·5	42·0	— 7·0	15·8	101·6	—32·6	38·03
1895	91·6	36·0	62·1	88·0	24·0	48·7	78·8	10·0	42·4	56·0	—12·0	24·4	54·0	—20·0	15·8	98·0	—34·0	36·80
1896	88·0	32·0	61·6	82·0	28·0	50·2	81·6	20·0	42·7	44·0	—30·0	4·0	48·0	—20·0	23·8	97·0	—32·0	37·70
1897	96·0	35·0	67·2	85·0	28·0	58·1	76·4	14·5	43·7	66·0	—32·0	15·2	40·0	—30·0	14·8	97·5	—40·0	38·00
1898	93·2	41·3	65·9	84·0	28·0	54·4	68·0	16·0	37·3	48·0	—18·0	22·0	43·0	—19·0	17·7	98·5	—20·0	37·90
1899	80·0	36·5	59·4	81·0	27·5	55·0	82·0	12·3	38·2	60·0	20·0	39·8	47·3	—15·0	16·8	98·0	—41·5	35·52
1900	95·0	39·0	62·9	80·0	23·0	51·4	70·0	13·0	43·6	59·0	—22·5	19·8	45·0	—21·0	24·2	104·0	— 35·0	40·79
1901	91·0	38·0	65·7	83·0	24·0	46·8	72·0	17·0	48·3	60·0	4·0	29·2	44·0	—27·0	19·5	92·0	—29·0	40·19
1902	88·0	32·0	63·1	82·0	25·0	52·2	78·0	18·0	44·1	50·0	— 6·0	23·3	39·0	—22·0	9·9	88·0	—28·0	38·2
1903	82·0	44·0	60·3	81·0	28·0	49·3	77·0	19·0	46·9	77·0	—17·0	23·6	54·0	—24·0	21·5	91·5	—34·0	38·2
1904	88·0	37·0	62·2	84·0	29·0	53·0	70·0	26·0	46·0	64·0	— 2·0	37·4	46·0	—25·0	17·8	93·0	—28·0	37·5
1905	91·0	40·0	67·3	81·0	32·0	55·9	83·0	4·0	38·1	63·0	—10·0	32·6	47·0	— 8·0	21·7	91·0	—34·0	40·1
1906	99·0	37·0	64·9	90·0	27·0	56·9	74·0	16·0	45·0	54·0	—11·0	24·8	38·0	—21·0	11·8	99·0	—32·0	40·3

Maximum, Minimum and Mean Temperatures at Medicine Hat, Alta.—Elevation above Sea Level, 2,171 feet.

Year.	January.			February.			March.			April.			May.			June.			July.		
	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1883																					
1884	44·3	—31·5	11·1	45·5	—38·1	9·4	50·0	—21·9	18·5	62·0	19·7	39·9	84·9	32·0	57·4	97·1	44·1	65·2	86·3	40·7	63·6
1885	41·2	—41·0	3·4	46·7	—33·8	10·3	65·0	9·1	34·7	79·0	12·0	44·2	85·1	16·7	55·7	97·7	40·0	63·6	93·7	39·7	65·9
1886	41·2	—50·5	— 4·7	60·8	—15·5	27·5	67·3	—13·6	29·1	75·6	16·5	48·1	92·2	21·2	58·0	95·4	32·6	68·6	108·2	47·6	68·3
1887	41·8	—36·9	— 0·1	42·6	—50·7	— 7·9	58·0	—18·6	30·4	78·6	18·7	44·4	93·7	29·7	56·7	85·5	35·0	60·2	89·9	36·3	66·6
1888	50·0	—39·9	— 2·1	42·2	—22·7	20·3	58·0	—24·7	17·8	76·0	9·8	42·3	82·4	30·3	52·8	86·9	32·7	60·7	100·4	44·7	66·9
1889	48·4	—23·6	10·5	55·8	—34·1	16·2	70·9	0·0	36·2	80·0	25·4	50·9	85·5	30·7	55·0	96·5	38·7	65·9	87·9	42·0	66·1
1890	42·0	—40·5	— 7·8	42·8	—40·5	0·3	51·0	— 7·0	25·4	77·7	9·8	42·6	83·9	20·7	55·0	98·0	37·7	64·3	102·1	40·7	71·0
1891	53·7	—13·8	24·6	35·6	—32·0	0·0	54·5	—35·0	22·9	82·8	17·4	50·4	90·2	18·7	54·9	88·0	38·4	61·1	90·6	42·6	68·5
1892	50·8	—35·1	14·0	48·7	—14·6	15·0	61·9	— 1·1	31·8	70·8	14·7	39·1	84·4	16·9	48·4	93·5	35·8	62·2	96·1	39·1	67·8
1893	50·3	—48·0	12·5	37·8	—46·2	1·6	50·3	—22·0	17·1	62·7	18·4	36·5	86·0	30·0	55·7	86·0	38·5	59·8	97·9	40·6	68·4
1894	48·2	—29·6	7·8	50·0	—30·5	14·2	61·6	—12·3	26·1	79·0	17·0	46·2	92·0	27·0	56·8	94·5	40·4	59·8	99·6	41·9	72·0
1895	45·7	—32·5	— 0·7	56·1	—36·5	10·8	69·0	—12·5	29·8	78·7	17·0	49·4	85·7	26·2	54·8	94·3	37·1	59·8	91·2	42·1	66·0
1896	52·6	—35·0	9·2	59·5	—19·6	25·3	60·4	—25·0	23·9	74·4	8·0	40·6	79·5	31·8	51·2	98·3	38·5	65·0	100·7	36·0	71·2
1897	49·7	—50·0	11·5	39·1	—22·5	11·4	51·8	—38·0	11·3	81·7	20·0	47·4	90·7	33·0	62·0	85·7	35·5	61·5	92·8	45·1	65·8
1898	39·9	—16·0	19·6	48·3	—25·0	16·0	43·8	—20·0	17·6	77·8	0·0	41·9	80·8	28·0	54·8	94·8	31·4	61·9	101·8	44·1	69·3
1899	46·3	—26·0	13·0	49·8	—45·0	2·2	43·3	—27·0	8·8	74·1	—16·0	38·3	78·2	12·8	49·6	90·6	39·0	60·6	97·8	47·6	68·1
1900	62·0	—18·0	24·6	45·0	—34·9	9·0	63·8	—16·1	28·7	80·5	26·8	50·5	86·0	33·0	58·3	106·6	37·0	67·0	101·8	44·1	69·0
1901	44·8	—32·0	15·4	53·0	—17·0	14·9	59·5	— 6·5	34·5	80·4	15·5	45·1	88·6	27·7	58·7	78·6	31·5	55·0	91·8	41·2	67·0
1902	57·3	—32·0	20·4	45·4	—18·0	16·0	53·8	—13·5	31·2	70·5	15·7	44·2	86·5	29·7	56·4	83·0	34·2	56·6	96·0	44·2	64·4
1903	46·0	—22·8	18·9	42·0	—27·8	16·7	58·0	—24·0	18·3	78·0	14·5	44·1	92·0	28·7	52·4	87·0	39·7	64·0	93·0	42·7	65·4
1904	50·0	—14·6	18·3	45·0	—30·8	— 0·3	43·0	—12·6	16·2	77·0	19·7	45·7	79·0	30·7	55·0	95·0	35·7	62·0	102·0	41·7	70·4
1905	49·0	—20·5	10·2	64·0	—44·0	13·5	68·0	— 6·5	40·6	80·0	12·7	45·8	82·0	30·7	52·3	90·0	34·7	59·2	95·0	46·7	68·3
1906	55·0	—30·8	18·4	59·0	—15·5	25·8	75·0	—21·5	27·6	94·0	10·4	50·6	88·0	19·7	52·1	84·0	44·7	61·0	96·0	41·7	71·3

Alberta Horses, C.P.R.



Alberta Mutton, C.P.R.

Maximum, Minimum and Mean Temperatures at Swift Current, Sask.—Elevation above Sea Level, 2,423 feet.

Year.	January.			February.			March.			April.			May.			June.			July.		
	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1886	36·4	—39·0	— 7·4	69·0	—25·4	18·9	63·0	— 8·6	21·8	75·2	11·2	42·7	86·2	24·0	53·1	94·4	29·2	63·8	106·6	43·4	72·7
1887	37·0	—36·0	— 3·8	50·0	—42·4	— 7·7	56·0	—19·0	23·3	75·0	9·6	39·1	85·4	26·0	51·8	82·6	26·4	58·5	90·0	34·8	64·3
1888	46·4	—40·2	— 6·1	47·0	—24·0	13·0	55·6	—25·6	11·8	70·4	4·4	35·7	73·0	23·4	48·0	88·0	32·0	57·9	94·0	38·0	64·6
1889	38·2	—25·2	9·0	49·2	—30·4	13·2	68·2	—10·0	32·0	78·2	23·6	45·6	85·0	22·2	49·6	96·0	34·0	60·7	86·6	34·6	62·5
1890	37·4	—40·2	— 6·9	42·0	—40·0	— 4·1	46·6	—10·0	19·0	76·4	7·0	38·3	78·2	17·2	49·1	94·4	35·4	62·6	100·6	34·4	68·1
1891	46·0	—25·0	19·2	31·4	—30·0	— 3·1	49·2	—27·4	17·2	79·2	9·2	45.2	92·4	10·4	50·6	80·0	34·6	56·4	86·6	42·6	62·6
1892	45·4	—34·6	6·6	39·4	—24·4	8·7	53·4	— 8·0	23·5	65·6	11·6	35·0	77·4	20·4	45·1	86·0	37·4	58·3	96·4	36·0	63·6
1893	36·2	—46·2	7·3	34·4	—49·8	— 1·6	43·2	—14·0	12·5	56·0	12·8	30·8	78·8	28·0	52·2	87·0	38·6	59·6	96·6	39·0	65·9
1894	44·0	—32·6	2·8	40·4	—27·6	8·4	51·0	—10·0	20·0	78·0	18·0	42·2	89·0	26·0	53·6	91·6	39·4	63·8	101·6	41·0	70·3
1895	38·2	—30·2	— 3·5	48·0	—34·0	7·0	57·0	—16·0	23·5	77·4	21·0	47·8	84·6	28·0	51·7	93·6	30·0	57·0	98·0	45·0	65·0
1896	50·0	—32·0	6·3	50·0	—22·0	21·6	52·0	— 6·0	20·5	68·0	15·6	39·1	77·8	32·0	50·1	94·0	40·0	63·7	97·0	40·0	69·3
1897	40·0	—40·0	9·6	34·0	—20·0	10·5	40·6	—34·0	8·7	78·6	20·0	43·3	90·0	36·0	58·5	95·0	33·4	61·2	97·5	37·5	65·5
1898	33·0	—12·8	17·2	41·3	—20·0	12·3	41·5	—20·0	13·4	73·0	2·0	36·4	79·5	26·0	52·0	95·0	34·0	59·8	98·5	40·8	66·3
1899	41·0	—33·5	7·1	41·5	—41·5	— 2·5	41·0	—22·5	4·9	67·0	— 5·5	36·2	72·0	22·3	47·5	83·0	33·0	57·9	98·0	44·0	65·9
1900	59·0	—16·5	21·7	40·0	—35·0	4·2	66·0	—16·0	23·1	74·5	23·5	46·7	90·0	28·0	57·5	104·0	32·0	65·8	95·0	40·0	66·6
1901	42·0	—29·0	9·3	44·0	—18·0	9·4	50·0	—12·(	28·2	83·0	17·0	43·5	91·0	23·0	59·7	76·0	33·0	55·2	92·0	43·0	67·5
1902	51·1	—23·0	16·9	42·0	—28·0	13·0	47·0	—12·(	25·4	64·0	16·0	40·0	87·0	30·0	54·8	80·0	33·0	53·5	88·0	41·0	62·7
1903	42·0	—18·0	15·1	38·0	—34·0	10·5	53·0	—20·0	14·8	76·0	15·0	42·3	91·5	13·0	49·3	86·0	35·0	61·7	90·0	43·0	62·6
1904	40·0	—24·0	10·1	35·0	—28·0	— 3·1	39·0	—22·0	11·6	77·0	12·0	38·3	77·0	28·0	51·7	93·0	38·0	60·2	93·0	39·0	65·0
1905	46·0	—25·0	6·2	58·0	—34·0	11·6	66·0	— 2·(	35·4	78·0	8·0	41·1	79·0	26·0	49·2	87·0	32·0	57·7	85·0	48·0	64·3
1906	45·0	—32·0	14·4	50·0	—17·0	17·2	70·0	—19·0	22·9	86·0	15·0	47·7	87·0	24·0	49·9	89·0	40·0	59·8	91·0	38·0	67·9

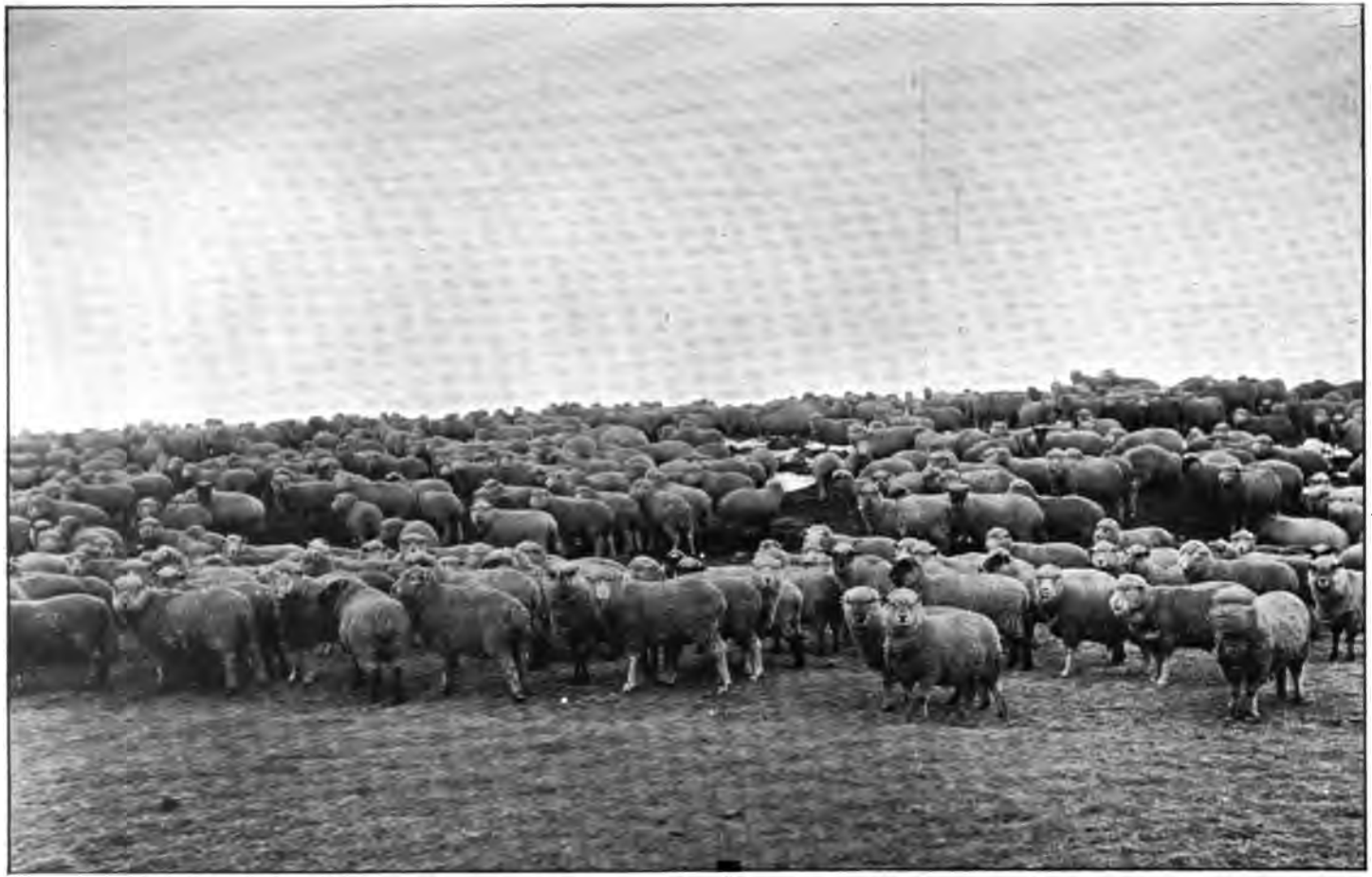
Maximum, Minimum and Mean Temperatures at Swift Current, Sask.—Elevation above Sea Level, 2,423 feet.—*Continued.*

Year.	August.			September.			October.			November.			December.			Annual.		
	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1886	91·6	31·2	64·7	86·0	19·0	49·3	82·0	13·0	41·6	66·0	—12·0	22·7	40·4	—33·0	7·6	106·6	—39·0	37·62
1887	85·4	36·4	59·3	81·4	25·4	53·1	76·4	— 4·0	36·0	67·4	—27·0	23·4	42·4	—30·6	7·0	90·0	—42·4	31·73
1888	95·0	35·4	61·6	86·0	28·0	55·5	77·6	12·0	39·7	48·8	0·4	23·0	58·0	7·0	19·7	95·0	—40·2	35·37
1889	95·7	32·8	65·7	88·6	21·5	50·9	88·7	11·9	42·7	62·0	— 8·0	25·3	48·0	—17·0	11·0	96·0	—30·4	39·02
1890	92·8	35·4	61·0	86·0	16·4	49·3	71·9	22·0	39·1	64·0	3·4	32·5	55·4	— 3·4	24·2	100·6	—40·2	36·02
1891	92·0	34·6	62·2	89·4	30·0	54·1	72·4	9·0	38·8	55·6	—14·0	20·3	43·4	—18·6	17·6	92·4	—30·0	36·76
1892	96·0	40·0	63·3	85·0	30·0	54·0	82·4	16·6	42·4	62·8	—10·0	19·6	32·0	—32·8	7·7	96·4	—34·6	35·90
1893	101·0	35·4	64·6	96·0	18·0	49·9	67·0	13·2	33·9	60·0	—31·0	16·6	41·2	—36·4	13·6	101·0	—49·8	33·78
1894	97·0	42·0	68·3	86·0	26·0	50·6	74·0	20·0	38·0	63·4	—13·0	22·5	42·0	— 7·0	15·8	101·6	—32·6	38·03
1895	91·6	36·0	62·1	88·0	24·0	48·7	78·8	10·0	42·4	56·0	—12·0	24·4	54·0	—20·0	15·8	98·0	—34·0	36·80
1896	88·0	32·0	61·6	82·0	28·0	50·2	81·6	20·0	42·7	44·0	—30·0	4·0	48·0	—20·0	23·8	97·0	—32·0	37·70
1897	96·0	35·0	67·2	85·0	28·0	58·1	76·4	14·5	43·7	66·0	—32·0	15·2	40·0	—30·0	14·8	97·5	—40·0	38·00
1898	93·2	41·3	65·9	84·0	28·0	54·4	68·0	16·0	37·3	48·0	—18·0	22·0	43·0	—19·0	17·7	98·5	—20·0	37·90
1899	80·0	36·5	59·4	81·0	27·5	55·0	82·0	12·3	38·2	60·0	20·0	39·8	47·3	—15·0	16·8	98·0	—41·5	35·52
1900	95·0	39·0	62·9	80·0	23·0	51·4	70·0	13·0	43·6	59·0	—22·5	19·8	45·0	—21·0	24·2	104·0	— 35·0	40·79
1901	91·0	38·0	65·7	83·0	24·0	46·8	72·0	17·0	48·3	60·0	4·0	29·2	44·0	—27·0	19·5	92·0	—29·0	40·19
1902	88·0	32·0	63·1	82·0	25·0	52·2	78·0	18·0	44·1	50·0	— 6·0	23·3	39·0	—22·0	9·9	88·0	—28·0	38·2
1903	82·0	44·0	60·3	81·0	28·0	49·3	77·0	19·0	46·9	77·0	—17·0	23·6	54·0	—24·0	21·5	91·5	—34·0	38·2
1904	88·0	37·0	62·2	84·0	29·0	53·0	70·0	26·0	46·0	64·0	— 2·0	37·4	46·0	—25·0	17·8	93·0	—28·0	37·5
1905	91·0	40·0	67·3	81·0	32·0	55·9	83·0	4·0	38·1	63·0	—10·0	32·6	47·0	— 8·0	21·7	91·0	—34·0	40·1
1906	99·0	37·0	64·9	90·0	27·0	56·9	74·0	16·0	45·0	54·0	—11·0	24·8	38·0	—21·0	11·8	99·0	—32·0	40·3

Maximum, Minimum and Mean Temperatures at Medicine Hat, Alta.—Elevation above Sea Level, 2,171 feet.

Year.	January.			February.			March.			April.			May.			June.			July.		
	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1883																					
1884	44·3	—31·5	11·1	45·5	—38·1	9·4	50·0	—21·9	18·5	62·0	19·7	39·9	84·9	32·0	57·4	97·1	44·1	65·2	86·3	40·7	63·6
1885	41·2	—41·0	3·4	46·7	—33·8	10·3	65·0	9·1	34·7	79·0	12·0	44·2	85·1	16·7	55·7	97·7	40·0	63·6	93·7	39·7	65·9
1886	41·2	—50·5	— 4·7	60·8	—15·5	27·5	67·3	—13·6	29·1	75·6	16·5	48·1	92·2	21·2	58·0	95·4	32·6	68·6	108·2	47·6	68·3
1887	41·8	—36·9	— 0·1	42·6	—50·7	— 7·9	58·0	—18·6	30·4	78·6	18·7	44·4	93·7	29·7	56·7	85·5	35·0	60·2	89·9	36·3	66·6
1888	50·0	—39·9	— 2·1	42·2	—22·7	20·3	58·0	—24·7	17·8	76·0	9·8	42·3	82·4	30·3	52·8	86·9	32·7	60·7	100·4	44·7	66·9
1889	48·4	—23·6	10·5	55·8	—34·1	16·2	70·9	0·0	36·2	80·0	25·4	50·9	85·5	30·7	55·0	96·5	38·7	65·9	87·9	42·0	66·1
1890	42·0	—40·5	— 7·8	42·8	—40·5	0·3	51·0	— 7·0	25·4	77·7	9·8	42·6	83·9	20·7	55·0	98·0	37·7	64·3	102·1	40·7	71·0
1891	53·7	—13·8	24·6	35·6	—32·0	0·0	54·5	—35·0	22·9	82·8	17·4	50·4	90·2	18·7	54·9	88·0	38·4	61·1	90·6	42·6	68·5
1892	50·8	—35·1	14·0	48·7	—14·6	15·0	61·9	— 1·1	31·8	70·8	14·7	39·1	84·4	16·9	48·4	93·5	35·8	62·2	96·1	39·1	67·8
1893	50·3	—48·0	12·5	37·8	—46·2	1·6	50·3	—22·0	17·1	62·7	18·4	36·5	86·0	30·0	55·7	86·0	38·5	59·8	97·9	40·6	68·4
1894	48·2	—29·6	7·8	50·0	—30·5	14·2	61·6	—12·3	26·1	79·0	17·0	46·2	92·0	27·0	56·8	94·5	40·4	59·8	99·6	41·9	72·0
1895	45·7	—32·5	— 0·7	56·1	—36·5	10·8	69·0	—12·5	29·8	78·7	17·0	49·4	85·7	26·2	54·8	94·3	37·1	59·8	91·2	42·1	66·0
1896	52·6	—35·0	9·2	59·5	—19·6	25·3	60·4	—25·0	23·9	74·4	8·0	40·6	79·5	31·8	51·2	98·3	38·5	65·0	100·7	36·0	71·2
1897	49·7	—50·0	11·5	39·1	—22·5	11·4	51·8	—38·0	11·3	81·7	20·0	47·4	90·7	33·0	62·0	85·7	35·5	61·5	92·8	45·1	65·8
1898	39·9	—16·0	19·6	48·3	—25·0	16·0	43·8	—20·0	17·6	77·8	0·0	41·9	80·8	28·0	54·8	94·8	31·4	61·9	101·8	44·1	69·3
1899	46·3	—26·0	13·0	49·8	—45·0	2·2	43·3	—27·0	8·8	74·1	—16·0	38·3	78·2	12·8	49·6	90·6	39·0	60·6	97·8	47·6	68·1
1900	62·0	—18·0	24·6	45·0	—34·9	9·0	63·8	—16·1	28·7	80·5	26·8	50·5	86·0	33·0	58·3	106·6	37·0	67·0	101·8	44·1	69·0
1901	44·8	—32·0	15·4	53·0	—17·0	14·9	59·5	— 6·5	34·5	80·4	15·5	45·1	88·6	27·7	58·7	78·6	31·5	55·0	91·8	41·2	67·0
1902	57·3	—32·0	20·4	45·4	—18·0	16·0	53·8	—13·5	31·2	70·5	15·7	44·2	86·5	29·7	56·4	83·0	34·2	56·6	96·0	44·2	64·4
1903	46·0	—22·8	18·9	42·0	—27·8	16·7	58·0	—24·0	18·3	78·0	14·5	44·1	92·0	28·7	52·4	87·0	39·7	64·0	93·0	42·7	65·4
1904	50·0	—14·6	18·3	45·0	—30·8	— 0·3	43·0	—12·6	16·2	77·0	19·7	45·7	79·0	30·7	55·0	95·0	35·7	62·0	102·0	41·7	70·4
1905	49·0	—20·5	10·2	64·0	—44·0	13·5	68·0	— 6·5	40·6	80·0	12·7	45·8	82·0	30·7	52·3	90·0	34·7	59·2	95·0	46·7	68·3
1906	55·0	—30·8	18·4	59·0	—15·5	25·8	75·0	—21·5	27·6	94·0	10·4	50·6	88·0	19·7	52·1	84·0	44·7	61·0	96·0	41·7	71·3

Alberta Horses, C.P.R.



Alberta Mutton, C.P.R.

Alberta Railway and Irrigation Company.—Main Ditch.

Alberta Railway and Irrigation Company.—Dredge.

Maximum, Minimum and Mean Temperatures at Medicine Hat, Alta.—Elevation above Sea Level, 2,171 feet.—*Continued.*

Year.	August.			September.			October.			November.			December.			Annual.		
	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Mi.	Mean.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1883	89·9	33·7	64·4	84·1	22·3	55·4	66·6	20·6	37·0	57·0	—30·1	20·6	50·0	—21·5	18·5	.....	.....	.....
1884	93·1	38·4	64·8	75·5	23·0	48·4	79·9	10·2	43·2	66·0	—12·5	32·4	61·0	—50·0	— 0·6	97·1	—50·0	37·77
1885	95·2	39·2	65·3	93·2	24·3	57·2	81·2	12·7	45·2	61·7	11·1	38·1	65·0	—18·8	28·4	97·7	—41·0	42·67
1886	95·2	35·0	70·2	85·2	28·5	54·8	82·8	18·6	45·7	63·2	—23·6	27·5	48·5	—36·5	14·2	108·2	—50·5	42·27
1887	91·3	36·7	62·8	83·0	29·1	57·5	78·0	—10·0	42·0	68·0	—35·3	28·3	47·2	—23·3	12·4	93·7	—50·7	37·78
1888	97·0	42·0	64·0	92·8	29·0	58·2	84·9	13·3	41·7	55·1	— 1·1	23·5	56·1	— 7.8	19·6	100·4	—39·9	38·64
1889	94·9	34·5	65·8	89·5	31·7	53·4	92·7	20·7	46·0	69·5	— 1·6	29·4	47·7	—28·6	13·6	96·5	—34·1	42·42
1890	91·5	41·2	65·0	88·8	25·0	52·6	71·7	22·0	42·5	68·0	— 0·9	36·5	62·0	— 1·2	28·6	102·1	—40·5	39·67
1891	92·8	38·2	66·1	94·0	28·7	56·3	73·5	9·5	43·7	60·8	—11·8	25·1	55·6	—23·3	22·5	94·0	—35·0	41·34
1892	97·0	40·3	64·3	89·2	28·1	55·4	84·0	17·0	43·7	67·7	—15·4	23·8	41·2	—28·0	10·8	97·0	—35·1	39·69
1893	104·0	36·7	66·6	90·6	23·0	51·4	68·8	6·0	38·4	60·4	—34·6	19·6	46·7	—33·0	18·2	104·0	—48·0	37·15
1894	98·2	46·1	70·6	89·2	26·8	52·8	75·1	20·0	41·6	72·7	5·0	28·6	50·2	—10·9	21·3	99·6	—30·5	41·48
1895	92·5	34·5	63·7	86·7	24·0	51·4	78·7	8·0	46·1	63·6	—13·0	28·2	59·6	—22·0	20·2	94·3	—36·5	40·00
1896	90·2	38·0	65·2	89·2	25·0	53·4	84·5	16·5	45·2	53·6	—36·0	2·0	52·6	—23·0	26·5	100·7	—36·0	39·90
1897	99·5	33·8	69·9	90·0	28·0	58·8	78·8	0·0	45·4	67·2	—26·0	15·5	46·8	—31·0	18·0	99·5	—50·0	39·90
1898	95·8	44·2	69·4	86·8	30·0	56·6	67·8	14·0	40·5	62·8	—11·0	23·2	59·8	—23·0	20·5	101·8	—25·0	40·90
1899	82·6	37·0	61·3	86·6	32·0	59·1	84·8	11·0	42·2	67·8	22·0	42·7	50·8	—25·0	22·0	97·8	—45·0	38·99
1900	97·0	32·0	63·4	81·3	17·5	53·4	75·8	18·5	44·9	67·8	—31·5	23·6	53·8	— 9·0	31·3	106·6	—34·9	43·64
1901	94·3	41·0	67·9	87·8	26·5	49·6	76·8	23·1	50·8	60·8	7·0	32·8	54·8	—13·0	27·3	93·4	—32·0	43·25
1902	93·0	33·2	66·5	85·0	27·7	56·2	79·0	17·7	47·9	56·0	— 3·4	26·3	41·0	—29·8	11·8	96·0	—32·0	41·5
1903	95·0	45·7	63·5	84·0	30·7	54·1	83·0	20·7	50·2	76·0	—25·8	25·1	65·0	—11·5	29·7	95·0	—27·8	41·9
1904	95·0	38·7	66·1	87·0	33·7	57·7	78·0	21·7	48·9	68·0	9·6	41·5	52·0	—28·8	22·4	102·0	—30·8	41·9
1905	95·0	41·7	69·6	87·0	27·7	59·8	85·0	1·6	42·4	66·0	—15·5	37·3	46·0	—15·8	26·0	95·0	—44·0	43·7
1906	103·0	42·7	67·3	88·0	28·7	60·4	78·0	22·7	49·4	60·0	— 9·4	28·9	43·0	—24·6	15·0	103·0	—30·8	43·9

Maximum, Minimum and Mean Temperatures at Calgary, Alta.—Elevation above Sea Level, 3,428 feet.

Year.	January.			February.			March.			April.			May.			June.			July.		
	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1885	51·9	—34·7	7·8	56·9	—23·6	16·0	70·0	9·6	36·7	72·0	4·5	39·5	74·0	15·6	49·1	85·0	32·6	56·6	85·0	31·7	56·6
1886	48·0	—39·7	— 2·1	57·0	— 8·5	26·4	64·0	—13·6	27·0	70·0	16·6	41·7	84·0	18·6	49·2	84·0	33·0	58·3	94·0	40·0	64·9
1887	39·0	—31·7	4·0	56·0	—42·7	— 4·1	75·0	—22·7	24·8	68·0	—15·6	38·6	90·0	23·1	49·6	84·5	28·0	53·5	84·5	32·7	60·3
1888	50·0	—30·7	— 1·8	52·0	—28·7	20·8	58·0	—28·7	15·0	72·0	1·5	35·1	75·0	26·6	47·5	77·0	27·6	54·0	92·0	38·0	59·2
1889	49·0	—20·1	16·7	54·0	—26·0	18·6	68·0	— 6·0	35·0	73·0	15·0	44·6	78·0	25·0	49·3	89·0	30·0	57·6	84·0	35·0	59·3
1890	50·0	—35·0	— 4·8	48·0	—39·0	1·1	45·0	— 7·0	21·9	77·0	— 2·0	35·6	81·0	23·0	48·0	88·0	38·0	57·3	93·0	39·0	60·3
1891	56·9	—20·0	26·5	39·8	—26·7	0·2	58·1	—25·3	23·6	74·1	11·6	43·3	88·1	18·9	49·4	83·9	26·0	54·9	87·9	35·2	61·5
1892	58·0	—18·4	14·5	51·9	—20·6	16·3	64·0	— 1·5	29·7	68·5	9·6	34·1	83·9	22·6	43·9	92·0	30·7	55·8	90·7	34·0	59·9
1893	50·8	—48·4	—14·7	45·1	—49·4	4·0	54·3	— 9·0	19·1	63·5	—10·0	32·7	79·6	29·0	49·4	77·9	35·0	52·2	90·0	39·0	59·2
1894	48·0	—31·8	8·6	49·6	—28·6	14·6	54·0	— 9·4	24·0	71·0	16·0	40·1	82·0	20·0	49·2	82·0	32·0	56·0	92·0	36·0	62·7
1895	51·0	—30·0	3·9	49·3	—38·0	13·4	58·0	—10·0	27·1	74·0	20·0	43·5	75·2	25·0	49·6	89·0	29·0	54·3	84·6	40·0	59·4
1896	51·0	—34·2	3·7	59·0	—21·2	24·3	55·3	—34·2	19·3	68·3	13·5	36·3	72·3	22·0	45·8	94·0	33·5	58·5	95·0	34·0	64·6
1897	45·5	—37·2	12·6	40·3	— 9·7	15·9	46·8	—28·4	11·4	75·8	18·5	43·7	88·0	28·5	57·9	78·8	29·8	57·0	86·3	39·0	59·2
1898	44·3	— 8·0	20·9	44·8	—20·0	14·5	42·3	—18·0	17·8	76·0	4·0	38·2	76·0	22·0	49·1	84·3	35·0	56·4	94·3	38·0	62·6
1899	49·0	—25·0	13·2	55·0	—40·0	2·4	49·0	—20·0	8·8	70·0	—14·0	33·8	71·0	12·0	44·4	77·0	34·0	53·2	89·0	35·0	60·3
1900	50·0	—15·0	22·1	50·0	—27·0	11·4	60·0	—22·0	28·2	76·0	21·0	44·1	79·0	28·0	51·8	92·0	30·0	57·6	85·0	36·0	58·2
1901	45·0	—35·0	16·6	57·0	—18·0	15·6	55·0	—10·0	30·4	72·0	13·0	38·7	85·0	20·0	52·5	77·0	32·0	50·4	80·0	37·0	58·9
1902	54·0	—30·0	20·3	46·0	—18·0	15·2	50·0	—24·0	25·9	65·0	14·0	39·7	82·0	25·0	49·0	76·0	29·0	49·5	84·0	38·0	58·1
1903	51·0	—12·8	21·6	47·0	—18·0	21·6	48·0	—25·0	14·6	66·0	16·0	37·5	84·0	23·0	46·1	81·0	34·0	57·9	81·0	38·0	56·8
1904	49·0	—22·0	17·6	38·0	—25·0	— 1·1	46·0	—25·8	13·3	76·0	18·0	43·0	76·0	23·0	48·0	85·0	26·0	54·3	94·0	34·0	61·0
1905	46·0	—20·0	10·0	57·0	—40·0	14·4	66·0	1·0	36·0	78·0	2·0	39·5	80·0	24·0	47·4	85·0	32·0	52·9	91·0	47·1	61·2
1906	54·0	—32·0	16·0	61·0	—16·0	24·3	73·0	—25·0	25·4	79·0	18·0	45·5	82·0	18·0	46·4	77·0	36·0	56·0	88·0	40·0	64·2

Maximum, Minimum and Mean Temperatures at Calgary, Alta.—Elevation above Sea Level, 3,428 feet.—*Continued.*

Year.	August.			September.			October.			November.			December.			Annual.		
	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1885	87·0	34·7	56·9	84·0	23·7	48·9	73·0	12·6	40·3	65·0	1·5	32·7	49·0	—11·0	3·5	87·0	—34·7	37·05
1886	85·0	28·1	59·4	80·0	27·6	49·4	81·0	8·0	40·8	64·0	—30·0	27·1	51·0	—31·7	14·4	94·0	—39·7	38·04
1887	80·3	32·2	56·8	82·5	23·6	50·3	77·0	7·5	39·9	65·0	—24·7	25·6	48·0	—20·5	9·0	92·0	—42·7	33·86
1888	90·0	38·0	58·8	89·0	27·6	53·8	79·0	6·5	37·2	58·0	—12·6	20·9	53·0	— 0·5	21·3	92·0	—30·7	35·15
1889	89·0	32·0	58·8	86·0	23·0	48·7	85·0	14·0	44·3	69·0	0·0	27·7	47·0	—16·0	13·9	89·0	—26·0	39·54
1890	87·0	32·9	58·0	83·7	20·6	49·0	70·0	10·7	38·0	70·0	0·5	37·9	57·9	3·8	25·8	93·0	—39·0	35·68
1891	88·0	36·7	58·2	81·4	24·4	50·8	76·9	5·6	42·1	56·9	—14·6	23·2	45·9	—25·6	18·8	88·1	—26·7	37·71
1892	90·7	35·2	57·8	85·6	15·4	50·4	81·8	7·2	40·0	68·3	—24·8	19·0	40·2	—33·7	12·0	92·0	—33·7	36·12
1893	94·7	34·0	60·5	86·0	27·0	48·3	61·4	1·4	34·8	53·3	—30·8	17·9	48·0	—30·1	17·7	94·7	—49·4	31·76
1894	92·0	39·5	62·3	79·0	25·5	46·2	68·0	17·5	39·1	67·0	—10·5	24·3	49·0	— 5·5	18·9	92·0	—31·8	37·17
1895	83·0	33·0	57·3	79·3	23·0	44·9	76·0	19·0	45·5	65·0	—13·7	27·5	49·2	—11·1	19·6	89·0	—38·0	37·20
1896	85·3	38·0	60·0	85·0	24·0	49·3	73·3	16·5	41·3	47·3	—29·2	2·4	48·8	—15·5	26·1	95·0	—34·2	36·00
1897	90·3	34·5	62·7	79·6	26·0	52·4	73·3	6·0	42·2	59·0	—25·7	12·3	45·3	—26·0	18·2	90·3	—37·2	37·10
1898	87·0	33·0	63·0	81·0	24·0	51·8	61·0	14·0	35·9	48·0	—23·8	21·7	56·0	—31·0	21·4	94·3	—31·0	37·80
1899	78·0	30·0	53·7	77·0	32·0	53·6	77·0	4·0	36·7	58·0	14·0	37·1	56·0	—24·0	19·2	89·0	—40·0	34·70
1900	90·0	30·0	55·1	77·0	17·0	47·8	71·0	11·0	38·1	64·0	—30·0	20·6	50·0	— 3·0	27·8	92·0	—30·0	38·57
1901	85·0	35·0	59·3	75·0	23·0	45·3	74·0	18·0	47·9	60·0	— 5·8	28·4	60·0	— 3·8	26·3	85·0	—35·0	39·19
1902	81·0	31·0	58·1	75·0	24·3	48·7	74·0	22·0	45·0	49·0	—16·0	21·5	47·0	—26·8	12·4	84·0	—30·0	36·92
1903	80·0	36·0	55·4	76·0	26·0	47·1	79·0	18·0	44·6	68·0	—20·0	21·1	54·0	—22·0	26·2	84·0	—25·0	37·5
1904	85·0	37·0	56·6	78·0	21·0	51·0	75·0	21·0	43·7	60·0	6·0	35·5	52·0	—22·0	20·2	94·0	—25·8	36·9
1905	86·0	33·0	59·9	80·0	22·0	51·5	72·0	3·0	37·4	70·0	—25·0	33·7	47·0	—14·0	24·6	91·0	—40·0	39·0
1906	92·0	34·0	59·5	82·0	24·0	51·4	77·0	22·0	44·4	60·0	— 8·0	26·9	50·0	—27·8	11·6	92·0	—32·0	39·3

Maximum, Minimum and Mean Temperatures at Macleod, Alta.—Elevation above Sea Level, 3,128 feet.

Year.	January.			February.			March.			April.			May.			June.			July.		
	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min	Mean.	Max.	Min.	Mean.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1895																					
1896	26·9	— 1·0	13·0	61·0	—17·0	31·1	60·0	—31·0	24·8	71·0	8·0	39·5	74·0	30·0	48·2	98·0	34·0	62·2	102·0	41·0	69·6
1897	50·0	—41·0	18·6	46·0	—13·0	24·4	56·0	—30·0	18·0	75·0	23·0	46·2	89·0	31·0	60·2	80·0	31·0	59·3	87·0	40·0	62·7
1898	46·0	—13·0	27·2	50·0	—18·0	22·2	49·0	—17·0	19·3	76·0	14·0	43·1	76·0	25·0	51·1	85·0	34·0	58·3	98·0	43·0	66·7
1899	50·0	—31·0	18·6	50·0	—36·0	6·2	47·0	—16·0	14·3	66·0	—10·0	37·4	71·0	15·0	49·5	83·0	38·0	57·1	96·0	41·0	65·2
1900	58·0	—16·0	28·0	46·0	—32·0	15·0	64·0	—17·0	30·6	77·0	22·0	47·1	81·0	32·0	55·4	98·0	33·0	62·4	94·0	43·0	63·5
1901	51·0	—30·0	19·4	58·0	—25·0	17·5	61·0	—15·0	33·8	75·0	15·0	41·1	84·0	22·0	55·2	79·0	31·0	52·1	94·0	38·0	63·8
1902	58·0	—30·0	23·8	51·0	—22·0	19·7	54·0	—27·0	29·4	65·0	15·0	41·6	84·0	32·0	52·2	81·0	31·0	54·1	89·0	42·0	62·6
1903																					
1904	51·0	—20·0	21·2	45·0	—26·0	5·3	47·0	—13·0	17·4	75·0	11·0	45·5	79·0	5·0	46·8	88·0	14·0	53·6	96·0	38·0	63·9
1905	51·0	—22·0	13·5	59·0	—49·0	16·0	67·0	1·0	37·9	77·0	5·0	42·3	81·0	24·0	48·9	86·0	30·0	55·1	96·0	37·0	64·9
1906	56·0	—28·0	18·9	62·0	—16·0	25·0	82·0	—33·0	23·0	83·0	18·0	45·1	84·0	19·0	44·9	80·0	30·0	54·8	93·0	37·0	65·7

Year.	August.			September.			October.			November.			December.			Annual.		
	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1895	90·0	36·0	61·0	84·0	20·0	46·0	85·0	18·0	43·5	79·0	—10·0	30·8	58·0	—23·0	24·6			
1896	89·0	41·0	63·9	89·0	29·0	52·2	77·0	19·0	47·3	54·0	—33·0	4·7	63·0	—22·0	33·0	102·0	—33·0	40·80
1897	96·0	38·0	67·5	84·0	30·0	57·5	82·0	6·0	47·6	65·0	—27·0	17·9	46·0	—27·0	21·8	96·0	—41·0	41·80
1898	92·0	44·0	67·2	83·0	32·0	56·9	62·0	14·0	40·7	50·0	—19·0	28·2	56·0	—30·0	25·5	98·0	—30·0	42·20
1899	80·0	37·0	57·5	83·0	31·0	57·5	80·0	2·0	41·4	65·0	16·0	42·6	50·0	—25·0	21·2	96·0	—36·0	39·04
1900	90·0	30·0	59·9	83·0	20·0	51·8	72·0	13·0	43·2	65·0	—29·0	25·7	56·0	— 2·0	34·2	98·0	—32·0	43·07
1901	94·0	40·0	64·4	83·0	28·0	46·6	77·0	22·0	50·5	60·0	2·0	35·3	53·0	— 4·0	28·8	94·0	—30·0	42·38
1902	87·0	31·0	63·0	80·0	28·0	53·7	78·0	21·0	48·0							89·0		
1903	87·0	43·0	59·5	77·0	29·0	50·6				64·0	—38·0	23·9	77·0	—17·0	31·5			
1904	91·0	39·0	60·9	84·0	24·0	52·8	81·0	15·0	44·0	66·0	10·0	41·4	53·0	—28·0	24·9	96·0	—28·0	39·8
1905	95·0	39·0	65·7	82·0	32·0	56·6	73·0	— 4·0	40·1	66·0	—14·0	35·1	49·0	—17·0	27·0	96·0	—49·0	41·9
1906	97·0	29·0	61·7	82·0	22·0	55·2	75·0	5·0	45·4	56·0	0·0	29·0	54·0	—30·0	14·8	97·0	—33·0	40·3

Rainfall at Chaplin, Sask.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
	°	°	°	°	°	°	°	°	°	°	°	°	°
1883.....										1·45	0·25	0·50	—
1884.....	1·10	2·45	0·42	0·42	0·11	4·03	1·83	2·49	3·62	1·43	0·44	0·60	18·94
1885.....	0·90	0·56	0·03	0·47	—	—	1·10	—	—	—	0·13	0·60	—
1886.....	—	—	—	1·20	0·95	0·76	0·75	0·95	0·22	0·04	0·44	1·12	—
1887.....	0·95	0·70	0·80	0·39	0·54	1·29	0·00	0·17	0·05	0·23	0·00	0·25	5·37
1888.....	0·63	0·55	0·55	0·60	1·13	0·45	0·10	0·18	0·00	0·57	0·10	0·05	4·91
1889.....	0·20	0·25	0·40	0·35	1·58	0·09	0·15	0·00	0·06	0·00	0·08	0·62	3·78
1890.....	0·20	1·10	0·30	0·10	0·15	1·36	0·09	0·21	0·17	1·58	0·00	0·00	5·26
1891.....	0·35	0·70	R	0·40	0·27	—	1·90	—	0·08	0·99	0·30	0·30	—
1892.....	0·00	0·20	0·20	0·80	0·04	0·51	0·00	—	—	0·00	0·77	0·20	—
1893.....	0·44	0·60	0·10	0·05	0·04	0·17	0·22	0·26	0·03	0·25	0·50	0·25	2·91
1894.....	0·25	0·20	0·66	0·86	0·24	0·19	0·00	0·08	0·21	0·89	0·50	0·00	4·08
1895.....	1·35	0·35	0·10	0·27	1·41	0·38	0·48	0·03	0·22	0·05	0·39	0·55	5·58
1896.....	0·45	0·25	0·65	1·22	3·30	0·52	0·36	1·09	0·19	0·08	1·35	0·20	9·66
1897.....	0·43	1·00	0·60	0·15	0·00	0·24	0·24	0·05	2·24	0·87	0·74	0·00	6·56
1898.....	0·10	0·40	1·30	0·00	0·03	2·38	0·13	0·15	1·09	0·25	0·62	0·00	6·40
1899.....	0·55	0·10	0·70	0·09	1·47	0·59	1·19	0·31	0·06	0·61	0·08	0·15	5·90
1900.....	0·00	1·00	0·30	0·23	0·22	0·25	0·10	0·55	0·72	0·60	0·60	0·20	4·77
1901.....	0·70	0·20	0·05	0·37	0·16	0·63	0·43	0·00	1·08	0·10	0·10	0·60	4·42
1902.....	0·10	0·85	0·73	0·06	2·77	1·62	1·47	0·23	0·23	0·00	0·20	1·00	9·26
1903.....	0·00	0·30	0·58	0·26	0·81	0·18	—	0·68	0·03	0·00	0·50	0·00	—
1904.....	0·50	0·90	2·80	0·00	0·06	—	—	—	—	—	—	—	—
1905.....	1·60	0·15	0·53	0·30	1·56	2·90	0·95	0·66	0·68	1·00	1·30	0·00	11·63
1906.....	0·90	0·60	0·30	1·88	3·60	5·18	0·55	1·04	1·53	0·13	2·91	1·70	20·52

Rainfall at Swift Current, Sask.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
	°	°	°	°	°	°		°	°	°	°	°	°
1886.....	0·43	0·70	0·50	2·03	1·86	0·85	1·35	0·60	0·50	0·32	0·80	0·68	10·62
1887.....	0·87	1·49	0·51	1·60	1·56	3·85	3·70	1·62	1·44	0·64	0·11	0·62	18·01
1888.....	0·51	0·84	1·14	0·68	0·63	4·92	0·67	2·34	0·38	1·32	0·28	0·38	14·09
1889.....	0·65	0·38	0·68	0·52	2·42	1·44	2·77	R	0·10	R	0·31	1·19	10·46
1890.....	0·84	0·74	0·68	0·74	1·30	3·44	0·88	2·70	1·82	3·96	0·24	0·16	17·50
1891.....	0·36	0·44	1·44	1·52	1·16	6·80	3·36	3·20	1·64	2·07	1·32	1·24	24·55
1892.....	0·34	0·94	0·40	3·33	3·16	3·96	1·00	1·76	0·54	0·12	1·70	3·00	20·25
1893.....	1·34	1·26	0·98	0·24	0·37	0·37	3·22	2·28	0·56	1·53	0·70	1·02	13·87
1894.....	0·40	0·50	1·02	0·95	2·64	1·35	0·62	0·56	0·63	0·40	0·22	0·37	9·66
1895.....	1·29	0·50	0·20	0·04	1·77	3·02	3·32	0·34	0·97	0·04	0·24	0·56	12·29
1896.....	0·72	1·04	0·42	0·93	2·90	1·40	0·26	2·68	2·08	0·02	1·38	0·28	14·11
1897.....	0·57	0·84	0·24	0·08	0·26	0·83	6·27	1·28	2·60	0·88	1·50	0·89	16·24
1898.....	0·57	0·82	2·02	0·60	1·31	2·56	2·81	1·79	0·90	1·33	0·41	0·13	15·25
1899.....	0·62	0·30	1·31	0·25	2·40	3·17	3·95	4·75	0·64	1·07	0·59	0·33	19·38
1900.....	0·14	0·36	0·57	0·42	2·49	1·38	2·42	2·75	2·48	0·47	0·46	0·66	14·60
1901.....	1·32	0·50	0·30	0·42	1·99	4·18	4·29	0·56	3·84	0·46	0·22	0·50	18·58
1902.....	0·17	0·88	1·38	0·18	5·07	4·47	2·28	1·44	0·73	0·08	0·60	0·36	17·64
1903.....	0·70	0·56	1·42	0·85	3·23	2·26	4·11	3·04	1·04	0·14	0·42	0·61	18·38
1904.....	0·60	0·76	1·94	0·32	1·16	2·37	2·34	1·06	1·44	0·41	0·13	0·31	12·84
1905.....	0·24	0·48	0·20	1·00	3·75	3·62	3·98	0·14	1·12	0·68	0·36	0·11	15·68
1906.....	0·72	0·52	0·02	0·76	3·08	7·24	0·30	1·64	1·46	0·18	1·94	1·16	19·02

Rainfall at Medicine Hat, Alta.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
	°	°	°	°	°	°	°	°	°	°	°	°	°
1883.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0·96	0·35	0·24	
1884.....	0·50	0·50	0·86	0·19	1·30	2·21	2·64	1·19	3·84	0·25	0·96	0·40	14·93
1885.....	0·68	0·39	0·56	0·85	0·13	3·51	1·60	1·49	0·04	0·10	0·02	0·00	9·37
1886.....	0·00	0·00	0·32	0·80	1·41	1·53	0·78	0·11	0·19	0·79	0·51	0·28	6·72
1887.....	0·30	0·00	0·00	0·63	0·12	5·75	0·29	0·98	0·41	0·46	0·25	0·70	9·89
1888.....	0·45	0·62	0·90	0·20	2·20	3·22	4·78	1·00	0·06	0·66	0·18	0·40	14·67
1889.....	0·10	0·20	0·43	1·00	2·66	0·23	1·92	0·00	0·28	0·00	0·42	0·77	8·01
1890.....	0·42	0·31	0·50	0·03	0·33	3·30	0·50	2·10	0·93	0·58	R	0·13	9·13
1891.....	0·19	1·51	1·31	0·37	1·13	4·34	1·28	1·02	1·14	0·20	0·30	0·36	13·15
1892.....	0·16	0·40	0·31	1·48	1·03	0·89	1·87	3·00	0·22	0·04	1·40	1·42	12·22
1893.....	1·72	0·70	0·23	0·77	1·09	2·25	2·53	2·17	0·34	0·41	1·23	1·16	24·60
1894.....	0·58	0·92	0·99	0·54	1·33	2·25	0·39	0·81	2·18	0·81	1·08	0·06	11·94
1895.....	0·88	0·91	1·19	0·26	0·55	2·31	4·86	0·24	1·88	0·29	0·52	0·24	14·13
1896.....	1·38	1·24	1·01	2·26	3·10	1·59	1·11	1·79	1·74	0·55	2·12	0·29	18·18
1897.....	0·74	0·41	0·52	0·39	0·59	5·62	1·65	0·40	2·15	1·26	3·11	0·43	17·27
1898.....	0·45	1·07	1·62	1·42	0·48	1·51	2·45	2·22	1·07	1·71	1·23	0·67	15·90
1899.....	1·12	1·13	1·17	0·87	3·32	2·60	3·79	4·60	1·66	0·80	0·31	0·91	22·28
1900.....	0·47	1·04	1·05	1·25	1·62	2·26	2·67	5·65	1·92	1·02	1·95	1·15	22·05
1901.....	1·68	1·40	0·52	0·11	6·29	4·01	2·82	0·26	2·41	0·45	0·55	0·30	20·80
1902.....	0·98	0·65	0·20	0·10	3·18	3·17	2·04	0·80	0·22	0·39	0·80	1·15	13·68
1903.....	0·25	0·30	0·25	0·45	4·19	R	1·39	1·80	0·65	0·05	0·45	0·12	9·90
1904.....	0·35	0·67	1·20	0·53	1·10	2·04	1·19	0·92	0·68	0·52	R	0·50	9·70
1905.....	0·70	0·15	0·55	0·30	1·13	3·93	0·85	0·74	0·16	0·13	0·30	0·05	8·99
1906.....	0·50	0·10	0·05	0·23	4·37	2·64	0·09	2·16	0·05	0·44	1·04	0·95	12·52

Rainfall at Calgary, Alta.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
	°	°	°	°	°	°	°	°	°	°	°	°	°
1885.....	0·65	0·96	0·84	0·49	0·41	2·15	3·70	3·06	R	R	0·30	0·35	12·91
1886.....	0·18	0·28	1·03	1·16	1·72	3·30	0·20	0·00	0·76	0·79	0·35	1·55	11·32
1887.....	0·92	0·19	0·35	0·22	0·70	2·15	3·54	2·19	0·54	0·13	0·99	0·77	13·69
1888.....	0·24	1·76	0·90	1·67	2·05	3·70	3·23	2·08	0·23	1·01	0·41	0·23	17·51
1889.....	0·92	0·75	1·50	R	2·04	0·61	2·37	R	1·39	0·52	0·12	1·37	11·59
1890.....	0·88	0·85	0·82	0·71	2·13	2·27	2·21	3·47	0·51	0·86	0·17	0·06	14·94
1891.....	0·20	0·50	R	0·07	1·38	2·20	2·81	1·58	0·77	0·27	0·20	0·46	10·44
1892.....	0·03	0·03	0·07	0·60	0·06	1·07	2·40	1·10	0·50	0·66	1·30	0·09	7·91
1893.....	0·55	0·20	0·15	0·47	2·47	1·11	1·95	0·88	0·76	0·74	1·20	0·57	11·05
1894.....	0·41	0·03	0·67	0·96	4·05	1·10	0·10	1·47	1·30	0·11	1·11	0·40	11·71
1895.....	0·96	0·57	0·70	0·58	0·34	1·97	4·97	1·18	2·53	0·21	0·49	0·62	15·12
1896.....	0·90	1·94	1·13	0·64	1·94	1·22	1·84	1·66	1·46	0·70	2·26	0·36	16·05
1897.....	0·53	0·46	0·26	0·31	0·18	6·13	5·54	2·13	1·04	0·76	2·54	0·70	20·58
1898.....	S	0·90	1·57	0·29	2·05	3·21	3·87	2·17	0·54	0·28	0·30	0·40	15·58
1899.....	0·85	0·30	1·13	0·40	5·44	3·52	2·11	9·40	0·99	1·31	0·26	0·44	26·15
1900.....	0·25	0·40	0·40	2·04	1·32	3·56	2·02	1·29	3·99	0·40	1·80	0·10	17·57
1901.....	0·40	1·02	1·15	0·90	1·91	7·00	3·90	0·71	2·95	0·12	0·40	1·85	22·31
1902.....	0·40	0·60	0·62	0·60	8·90	8·82	5·06	6·40	1·57	0·61	0·39	0·60	34·57
1903.....	0·05	0·50	1·00	0·46	4·25	2·05	4·10	7·70	1·81	R & S	0·60	0·25	22·77
1904.....	0·15	0·15	0·86	0·14	1·56	1·99	1·74	2·75	0·69	1·35	0·20	0·31	11·89
1905.....	1·04	0·30	0·65	0·80	2·06	6·01	0·91	0·69	0·35	0·31	1·20	S	14·32
1906.....	0·04	0·14	0·70	0·37	6·96	2·35	1·15	3·00	0·04	0·90	0·34	0·25	16·24

Rainfall at Macleod, Alta.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
	°	°	°	°	°	°	°	°	°	°	°	°	°
1896.....	0·15	0·53	0·70	0·40	2·74	0·48	1·27	1·99	2·23	0·44	1·70	0·10	12·73
1897.....	0·10	0·10	0·58	1·20	0·00	4·20	2·16	0·15	0·92	0·33	2·40	0·63	12·77
1898.....	0·30	0·53	1·00	0·27	1·59	1·90	1·57	4·04	0·85	0·58	0·15	0·80	13·58
1899.....	1·08	0·25	1·10	0·70	3·43	1·92	4·13	2·40	1·75	1·67	0·05	1·26	19·74
1900.....	0·13	0·70	0·43	0·60	0·81	0·28	2·67	0·64	2·39	0·78	0·60	0·05	10·08
1901.....	0·26	0·58	0·35	0·80	2·06	4·31	1·24	0·43	1·91	0·04	0·45	0·50	12·93
1902.....	0·48	0·55	0·63	0·20	2·65	2·90	1·20	0·22	0·51	0·04	0·70	0·40	10·48
1903.....	0·60	0·50	0·70	1·22	0·42	1·10	2·30	2·34	0·35	0·00	0·00	0·00	9·53
1904.....	0·00	0·00	0·90	0·10	0·15	0·65	0·65	1·36	0·90	0·35	0·00	0·28	5·34
1905.....	1·60	0·15	0·53	0·30	1·56	2·90	0·95	0·66	0·68	1·00	1·30	0·00	11·63
1906.....	0·10	0·70	1·23	0·51	6·56	3·54	1·68	3·26	0·14	1·10	0·80	1·20	20·82

APPENDIX B.

REPORT OF THE PROCEEDINGS OF THE FIRST IRRIGATION CONVENTION OF WESTERN CANADA, HELD AT CALGARY, ALBERTA, JULY 17TH AND 18TH, 1907.

(OFFICIAL CALL.)

The first irrigation convention covering the Provinces of Saskatchewan, Alberta and British Columbia, will open in the City of Calgary, Alberta, on the 17th day of July, 1907.

It is gradually dawning on the minds of thinking people that the most significant development in agriculture that Western Canada has yet witnessed is the movement to utilize the great mountain streams in aiding the farmer largely to eliminate the element of uncertainty from his operations. Irrigation enterprises, private and corporate, now completed and actually under way in Western Canada, comprise an area equal to one-quarter of the total irrigated area of the whole of the United States, and the development is as yet in its infancy. Our mountain ranges contain natural reservoirs only awaiting the finishing touches of skill and labour to save water sufficient to irrigate vast areas, in addition to those that are now or can be provided for by our normal water supply. A propaganda so vast and fraught with such far-reaching interests, that enters so closely into the whole problem of Western Canada's colonization and future prosperity, is of deep concern to every resident of the Great West and imperatively demands the impetus, constructive guidance and moulding influence that can only be effectively brought to bear through a strong, permanent organization. The National Irrigation Congress of the United States is accomplishing this purpose south of the line, and the time has doubtless come when a similar movement should be instituted in Canada.

The whole question of irrigation in humid and sub-humid climates is now before the public in America. Experiments and investigations are being conducted at many agricultural colleges and public experimental stations, with a view to demonstrating that agricultural operations can be carried on as successfully under artificial watering in humid climates as in dry climates. While the result of withholding water in the latter is a total failure, the effect of using water under humid conditions, one year with the other, spells success.

A large and influential committee met at Calgary on Wednesday, the 24th ult., for the purpose of arranging details in connection with the forthcoming convention. The following gentlemen were present:

Wm. Pearce, Calgary; W. C. Ricardo, Vernon, B.C.; John Stewart, Calgary; W. H. Fairfield, Lethbridge; J. S. Dennis, Calgary, O. D. King, Raymond, J. R. Wheeler, Calgary; J. T. Hall, Medicine Hat; I. S. G. Van Wart, Calgary; M. Woolfe, Cardston; E. L. Richardson, Calgary; C. F. Harris, Macleod; C. W. Peterson, Calgary.

After a careful discussion, it was decided to fix the basis of representation as follows:

His Excellency, the Governor General of Canada.

The Lieutenant Governors of the Provinces of British Columbia, Saskatchewan and Alberta.

All members of the Dominion Parliament.

All members of the Legislative Assembly of the Provinces of British Columbia, Saskatchewan and Alberta.

The deputy heads of the departments of agriculture and public works of the Provinces of British Columbia, Saskatchewan and Alberta.

Editors of agricultural journals in Western Canada.

Two delegates each for all railways.

Two delegates each for all irrigation and irrigation colonization companies operating in the Provinces of British Columbia, Saskatchewan and Alberta.

The Dominion commissioner of irrigation.

Two delegates each for all agricultural, horticultural, forestry and live stock associations in British Columbia, Saskatchewan and Alberta.

Two delegates each for all municipal, village and rural organizations.

Three delegates each for all boards of trade, chambers of commerce and kindred organizations.

Five delegates for the Canadian Society of Civil Engineers.

Five delegates each for the Dominion and Provincial Land Surveyors' Association of British Columbia, Saskatchewan and Alberta.

One delegate each for experimental and demonstration farms.

All provincial irrigation commissioners.

The Dominion superintendent of forestry.

All who are interested in the utilization of the great natural resources of Western Canada, extending our agricultural prosperity by increasing the products of the land, thus insuring greater stability of prosperous conditions, making occupation upon the land attractive, the conservation of our forests, the extension of international trade and commerce and a wider knowledge of a great economic movement which has for its ultimate object the highest development of our inland empire, are cordially invited to attend the First Irrigation Convention of Western Canada.

It is expected that a most interesting programme wil be carried out. Resolutions and papers are to be submitted on the following subjects:—

Forestry as applied to irrigation.

Extension of surveys in connection with irrigation, having particular reference to gauging of streams and location of reservoir sites.

Agricultural and horticultural experiments and the use and duty of water on the irrigated farm.

The industrial development following in the wake of irrigation.

Laws relating to the use of water and the administration thereof.

(*a*) In British Columbia.

(*b*) In Alberta and Saskatchewan.

Social phase of the irrigation movement.

The co-relation of irrigation and drainage.

Status of irrigation in Canada.

Permanent organization.

An effort is also being made to induce the following gentlemen to address the convention:—

Prof. L. G. Carpenter, Director and Professor of Irrigation, Colorado Agricultural College, Fort Collins, Colorado.

Prof. F. H. Newell, Director Reclamation Branch, United States Department of the Interior, Washington, D.C.

Hon. George Day, Oakley, Cassia County, Idaho.

Mr. John Widstoe, Superintendent State Agricultural College, Logan, Utah.

Prof. B. C. Buffum, Director Experimental Station, Laramie, Wyoming.

Special railroad rates are now being made to apply from all parts of the three western provinces to Calgary and return, and it is expected that these rates will be the lowest offered to conventions.

It is respectfully but earnestly urged that in the appointment of delegates persons should be selected who are sincerely interested in the objects of and purpose attending the convention, and also that the appointments should be made at the earliest possible date. The names and post office addresses of all delegates should be sent to the undersigned in order that they may be mailed special information at the earliest

possible moment in regard to railway rates and revised programme. Delegates are advised themselves to communicate with the undersigned at the earliest possible moment, and every effort will be made to obtain suitable accommodations for them, and otherwise to look after their entertainment while in Calgary.

All newspapers and other publications are earnestly requested to give the widest possible publicity to this official call, and to impress upon their readers the far-reaching importance of the forthcoming convention.

C. W. PETERSON,
Chairman of Committee on Arrangements.

REVIEW OF THE PROCEEDINGS.

The first Irrigation Convention of Western Canada held at Calgary, Alberta, July 17 and 18, 1907, was attended by over one hundred very enthusiastic delegates, and was the means of accomplishing much good for the cause of irrigation in the area covered by the convention.

Early in March a few enthusiastic irrigationists concluded that irrigation in Western Canada had advanced to a point where it was most important that a convention should be held, and some cohesive effort made looking to intelligent legislation on the subject. An invitation was issued to representative men throughout the three provinces of British Columbia, Alberta and Saskatchewan to attend a meeting to be held at Calgary on April 24. The meeting was attended by the following delegates:—

Wm. Pearce, Calgary, Alberta; W. C. Ricardo, Vernon, British Columbia; W. H. Fairfield, Lethbridge, Alberta; J. S. Dennis, Calgary, Alberta; O. D. King, Raymond, Alberta; J. T. Hall, Medicine Hat, Alberta; I. S. G. Van Wart, Calgary, Alberta; J. R. Wheeler, Calgary, Alberta; M. Woolf, Cardston, Alberta; E. L. Richardson, Calgary, Alberta; C. W. Peterson, Calgary, Alberta; John Stewart, Calgary, Alberta; C. F. Harris, Macleod, Alberta.

At this meeting the basis of representation was fixed, and it was voted that the convention be held in Calgary upon the dates above mentioned.

While in Calgary the visiting delegates were entertained by the local members of the convention and the Board of Trade. They were shown the city, and given a luncheon on the 18th at the first engineering headquarters of the Canadian Pacific Railway Company's Irrigation Works.

The convention was opened by His Honour, Lieutenant Governor Forget, of Saskatchewan, with a speech, in which he paid a very glowing tribute to irrigation and the city of Calgary, and suggested that every effort be put forth to induce people to come to Calgary and settle upon the irrigated lands to the east of the city.

Hon. W. H. Cushing, Minister of Public Works for the Province of Alberta, followed with an address of welcome on the part of the Province of Alberta. His Worship Mayor Cameron addressed a few words of welcome to the assembly in the name of the city. Hon. F. J. Fulton, K.C., Provincial Secretary and Minister of Education for the Province of British Columbia, and Mr. Horace Greely, of Maple Creek, Saskatchewan, for the delegates from their respective provinces.

The press of the city was well represented and gave a very full report of the proceedings of the convention.

OFFICIAL PROCEEDINGS OF THE FIRST WESTERN CANADIAN IRRIGATION CONVENTION.

FIRST GENERAL SESSION.

ELKS' HALL, CALGARY, ALTA., WEDNESDAY, July 17, 1907.

Chairman C. W. Peterson, of Calgary, called the convention to order at 10 a.m. in the following words:—

'Gentlemen, it is my pleasure to be the one to call to order the first Western Canadian Irrigation Convention and to express my appreciation of the large and representative gathering I see before me. There is always a certain amount of speculation as to what the attendance at a first convention is going to be, and I am glad to say that those who have had the arrangements of this one in hand are more than gratified. It is with a great deal of regret that I have to inform you of the unavoidable absence of Mr. J. S. Dennis, who is one of the pioneers in irrigation development in Western Canada, and is at the head of the largest irrigation enterprise on the American continent.

'The secretary will now read the official call for the convention.'

After the call was read, Chairman Peterson introduced Lieutenant Governor Forget, of Saskatchewan, to officially open the convention, which His Honour did in the following speech:—

'Mr. President and members of the convention, owing to the unavoidable absence of Lieutenant Governor Bulyea, I have been asked to open this convention. Mr. Peterson has referred to the fact that I was the first governor of the old Northwest Territories, and that it would be a particularly happy coincidence that I should act as the honorary chairman at the opening of the First Western Canadian Irrigation Convention. Gentlemen it gives me much pleasure to accept the honour.

'Now, the primary reason for the convention assembling at this time is to bring before the public the vast importance of the whole subject of irrigation. It will be your duty to place before the public the value of artificial watering and to endeavour to impress upon their minds the great influence that irrigation will have upon the future of this Western country.

'Although irrigation has for years been practised to quite a large extent, little is known of the subject by the general public. Personally, I have come seeking knowledge on irrigation, for I must plead ignorance of this science in a real sense. And so I say it will be the duty of this convention to make irrigation and its benefits known to the largest number of people.

'I also wish to congratulate the City of Calgary on being the seat of this convention. Calgary stands in the proud position of being the best city in the West, and of having obtained that position through her own efforts and not through the help of any Government.

'With these few remarks I have much pleasure in declaring the First Western Canadian Irrigation Convention formally opened.'

Welcome by Hon. W. H. Cushing, Minister of Public Works for the Province of Alberta.

'Owing to the fact that Premier Rutherford is absent from the province it becomes my pleasant duty to give to this convention a word of welcome. Personally I am not much acquainted with the subject, but I hope to gain some information during the various sessions that will be held.

'The question of irrigation does not come under the purview of this province, only in so much as an interest in the work is manifested.

'But while the Provincial Government is not directly concerned, it has a deep interest in irrigation as an industrial institution, inasmuch as it believes it will

change hitherto sub-humid regions into productive agricultural lands. From this point of view the question is of great importance to the Province of Alberta.

'It is gratifying to me that this convention has been called to meet in the City of Calgary. I understand there are representatives here from the three provinces of the West, and also of the States to the south of us, and I simply welcome all the delegates assembled here in the name of the Provincial Government. I trust your convention will be a successful one and that your sojourn amongst us will result in much good to the whole Dominion.'

Welcome by His Worship Mayor Cameron.

'Mr. President and members of the convention. It is a great honour, as well as a great pleasure, to give at this time a welcome to so distinguished a body of gentlemen to the City of Calgary upon so great an occasion. I sincerely trust that your deliberations may result in great good to Western Canada.'

Response by Hon. F. J. Fulton, K.C., Commissioner of Lands and Works for the Province of British Columbia.

'Mr. President and gentlemen: It gives me great pleasure to be present at the First Irrigation Convention of Western Canada. I also have come here to learn about irrigation, fully realizing that there is a good deal to be learned on the subject, and that there is something to learn even for the man who knows most about the subject.

'Now, we in British Columbia have realized the importance of irrigation for many years. We have had some irrigation there, but our water laws are not what they should be, and I may say that our government has had amendments to them under consideration for some time. So it was with great pleasure that I heard that the question of an irrigation convention had been taken up.

'As a representative of the British Columbia Government, I may say that if this convention can be made an annual one—can be kept up from year to year—I know that a great deal will be learned that will be of great benefit to the provinces interested. We, in British Columbia, have had laws for years which were crude and incomplete. Your irrigation laws here in Alberta are as good or better than those you will find anywhere on the American Continent, and yet the feeling is that they can be bettered. And a convention such as this one is what will furnish the ideas, if acted upon by our legislature, that will build up an almost perfect set of irrigation laws.

'I also, on behalf of British Columbia, take pleasure in thanking the chairman for the welcome that has been extended to us.'

Response by Horace Greely, ex-M.L.A., for the Province of Saskatchewan.

'Mr. President and members of the Convention: In behalf of the Province of Saskatchewan, it gives me great pleasure to respond to the hearty addresses of welcome of the gentlemen who have preceded me. We are grateful for the kindly expressions, and sincerely hope that next year's convention will see a much larger delegation from my own province.

'Irrigation in Saskatchewan, while not practised to any large extent owing to the absence of water supply that can be made available by gravitation, is yet of no inconsiderable importance. The waters of nearly all the streams that can be utilized for irrigation were appropriated years ago. Our climatic conditions are such that we can grow, in the westerly portion of the Province, all the more tender fruits and vegetables, if only we had an adequate supply of irrigation waters. Any plan that might be worked out having in view the conservation of water on the prairie section of the West is of vast interest to us. The convention as an educational institution will have the support of at least the westerly portion of the Province of Saskatchewan.'

Chairman Peterson then read letters of regret from Hon. Walter Scott, Premier of Saskatchewan; Lieutenant Governor Bulyea, of Alberta; Hon. Frank Oliver, Minister of the Interior; R. L. Borden, Leader of the Federal Opposition; Prof. F. B. Linfield, Director of the State Agricultural College at Bozeman, Montana, who was to have read a paper at the convention but was unavoidably detained, and F. W. Crandall, an irrigation expert of San Jose, California, who had been called away from Calgary on the 16th instant.

The call for permanent officers of the convention was then made, and on motion of Mr. Wm. Toole, of Calgary, seconded by Mr. W. H. Fairfield, of Lethbridge, Mr. R. B. Bennett, K.C., of Calgary, was nominated and elected permanent chairman. Upon taking the chair, he made the following address:—

'Gentlemen: The essential feature of our irrigation laws is that we recognize our water supply as a part of the property of the Crown. One of the first things that this convention will have to consider is the measurement of water, and we should deliberate on how the Government should properly measure the different streams. The duty of water is another question that has a large bearing upon the areas that must ultimately be passed upon as irrigable or non-irrigable land. If the duty of water has been placed too low it means that the available supply of water will irrigate more land than it will if the present duty of one cubic foot a second for each 150 acres is maintained as the proper and just duty. If future experience teaches us that one cubic foot of water a second is sufficient for the irrigation of 200 acres of land it will readily be seen what a great addition this will give to the irrigable areas of Western Canada.

'The question of how to conserve the water is another matter of importance that will engage your attention. If the water that is going to waste to-day could be properly stored and handled there is enough to make every acre in the world at the present time tillable or make the desert bring forth crops in abundance.

'The struggle to interest the public in irrigation has been a long and arduous one, as our friend here, Mr. William Pearce, will doubtless testify. Mr. Pearce is one of the irrigation pioneers in Western Canada, and probably knows as much or more than does anyone else present of the obstacles irrigation has met with and overcome in this part of the world. It is largely due to the indefatigable work of such men as Mr. Pearce and Mr. Dennis that irrigation occupies the prominent place it does to-day in the agricultural development of Western Canada.

'It is only within the past few years that the efforts of Mr. Newell and other active disciples of irrigation in the United States have met with any considerable degree of legislative recognition. But it came at last, and that republic is now committed to an expenditure of nearly $40,000,000 for the construction of reservoirs and canals, that will bring under water at least 1,900,000 acres of now practically unproductive land. What those men have done there it should be our aim to accomplish here.'

Hon. F. J. Fulton was then elected Vice-Chairman, and Mr. J. R. Wheeler, Secretary of the Convention. A committee on resolutions and order of business was elected, consisting of Messrs. A. E. Ashcroft, Vernon, B.C.; M. Woolf, Cardston, Alta.; C. W. Peterson, Calgary, Alta.; H. A. Greeley, Maple Creek, Sask., and V. O. Curry, Kamloops, B.C.

A committee on credentials, composed of Mr. J. T. Hall, Medicine Hat, Alta., and Mr. J. R. Wheeler, Calgary, was elected, and made the following report:—

'Mr. President: Your committee on credentials have to report that the following named persons have presented duly executed credentials and are entitled to seats as delegates in the First Western Canadian Irrigation Convention:—

Alberta.

Wm. Pearce, Calgary.
W. Cousins, Medicine Hat.
Walter Huckvale, Medicine Hat.
John T. Hall, Medicine Hat.
H. L. Tweed, Medicine Hat.
J. T. Child, Calgary.
Martin Woolf, Cardson.
Ed. J. Wood, Cardston.
P. M. Skanson, Raymond.
C. D. Fox, Raymond.
R. B. Bennett, Calgary.
W. E. Brooks, Calgary.
Thos. J. Woolford, Cardston.
J. Stewart, Calgary.
Frank Leavitt, Cardston.
Chas. W. Peterson, Calgary.
H. W. White, Calgary.
H. H. Honens, High River.
W. H. Cushing, Calgary.
A. D. Shore, Gleichen.
J. J. Young, Calgary.
M. S. McCarthy, Calgary.
Wm. Leavitt, Calgary.
H. H. Stepney, Gleichen.
G. H. Stepney, Gleichen.
J. S. Skeen, Gleichen.
D. McDougall, Morley.
A. M. Grace, Medicine Hat.
C. H. Webster, Calgary.
J. R. Wheeler, Calgary.
R. A. Darker, Calgary.
G. S. Ferris, Nanton.
Charles H. Marshall, Nanton.
G. Lemoges, High River.
J. E. Varley, High River.
Ben. Matkin, Magrath.
Levi Harker, Magrath.
Arthur Dahl, Raymond.
Geo. W. Green, Raymond.
S. H. Hanah, Magrath.
J. F. Bradshaw, Magrath.
G. Forsyth, Magrath.
Christian Jansen, Magrath.
George Thomson, Magrath.
Walter, Ackroyd, Magrath.
John Powdson, Raymond.
H. S. Allen, Raymond.
J. B. Crapo, Cardston.
D. J. Whitney, Lethbridge.
W. H. Pamson, Lethbridge.
J. W. Woolf, Cardston.
L. D. King, Raymond.
A. E. Cross, Calgary.
H. R. McBride, Welling.
James Young, Gleichen.
C. H. Davidson, jr., Calgary.
I. S. G. VanWart, Calgary.
Wm. Oliver, Lethbridge.
James W. Davidson, Calgary.
W. O. Hutton, Lethbridge.
E. D. Macleod, High River.
P. L. Naismith, Lethbridge.
A. E. Humphries, Lethbridge.
Geo. Wells, Strathmore.
A. S. Dawson, Calgary.
W. B. Thorne, Calgary.
W. J. Wake, High River.
W. J. Tregillus, Calgary.
T. M. Babington, Medicine Hat.
J. T. Cooper, Nanton.
T. L. Beiseker, Calgary.
D. McGillicuddy, Calgary.

British Columbia.

Albert E. Ashcroft, Vernon.
R. M. Palmer, Victoria.
F. A. Tabey, Kelowna.
A. E. Meighen, Kamloops.
Price Ellison, Vernon.
V. D. Currey, Kamloops.
J. T. Robinson, Kamloops.
J. A. McKelvie, Vernon.
K. C. McDonald, Vernon.
Wm. A. Sharpe, Agassiz.
J. A. Macdonald, Rossland.
Edward Carruthers, Kelowna.
Chas. F. McHardy, Nelson.
Arthur Venables, Vernon.
W. H. Gaddes, Kelowna.
J. D. Lauder, Kamloops.
Fred. J. Fulton, Victoria.
M. S. Wade, Kamloops.
W. R. Megaw, Vernon.
Geo. S. B. Parry, Vancouver.
D. W. Rowlands, Ashcroft.

Saskatchewan.

H. A. Greeley, Maple Creek.
Edw. Fearon, Maple Creek.

Ontario.

R. H. Campbell, Ottawa.

Quebec.

E. A. Mackenzie, Montreal.

Mr. A. E. Ashcroft, Vernon, B.C., and Mr. I. S. G. VanWart, Calgary, were elected to nominate a committee on permanent organization, and made the following report:—

'We, your committee appointed to nominate a committee on permanent organization, beg leave to make the following report:—

'We recommend the election of the following named delegates to this convention as its committee on permanent organization:—

'William Pearce, Calgary; John T. Hall, Medicine Hat; D. E. Harris, Cardston; C. W. Peterson, Calgary; Albert E. Ashcroft, Vernon, and I. S. G. VanWart, Calgary.'

The committee as named was unanimously elected, and an adjournment was taken until 2 p.m., July 17th.

AFTERNOON SESSION, WEDNESDAY JULY 17.

The Chairman called the convention to order promptly at 2 p.m., and introduced Mr. C. A. Fleming, C.E., of the Civil Service of India.

THE DEVELOPMENT OF IRRIGATION IN INDIA.

(By C. A. Fleming, C.E.)

'On reaching Calgary on Monday last, the Secretary of the Irrigation Convention, Mr. Wheeler, said that he had entered my name for a paper on "Indian Irrigation Development."

'If the members of this convention will accept round figures, an attempt will be made to give an idea of what is being done in India. The subject is a fairly large one, and India is a very large country. My experience has been entirely confined to the Punjab, hence it appears better to limit the range somewhat.

'The sources of water supply are various. For example, in Madras more than two million acres a year are irrigated from tanks.

'In the Punjab itself three and one-half million acres are irrigated from wells, and in the neighbouring provinces of Agra and Oudh the well-irrigated area is even greater.

'In parts of the country private canals have also been dug, from which considerable areas are irrigated.

'For the present our attention will be entirely confined to the larger canals constructed by the Government in the Punjab.

'The British Government is only the last of several governments who have held sway over that province. The early Aryans, in prehistoric times, when they dwelt in those plains may have turned their hands to irrigation. Later on Mohammedan rulers did much to foster irrigation. Much ground was lost under the later weak Mohammedan kings. The channels were not repaired, and as far as distribution of supply was concerned, might was right. Early in the beginning of last century, when Lord Lake reached Delhi and scattered the Mahratta hordes, who were devastating the country, firm rule was again set up, and the earliest efforts of the British Government were directed towards reopening the canals from the Jumna River.

'In most cases the old faulty alignments passing along drainages were followed, from which it was not possible for water to reach the higher land on either side. Partial improvements have from time to time been made, but it would have been much more satisfactory if complete surveys had been made and the canal constructed anew.

'Besides the Jumna there are other rivers passing through the province from which perennial supplies are available. One river after another in the Punjab has been dealt with, until six of the seven have been dammed, and for six months in the year not a drop of water goes below these dams. During the remaining six months of the year floods, liable to enormous fluctuations, pass down. No attempt has yet

been made to deal with these flood supplies. The seventh river referred to above is the Indus. It is a much longer river than any of the others, the minimum discharge being about 30,000 to 40,000 cubic feet per second.

'Schemes are being prepared for carrying out large works in the Province of Scinde, in order to utilize the waters of this river. There are also under construction works for the joining up of different rivers so that the surplus supply in one may be available in another.

'The area annually irrigated from these large canals (Government) is six and one-quarter million acres.

'All these rivers flow from the Himalayas, passing across the plains in a north-east and southwest direction. The plain country is extremely flat, with a slope of only two feet in a mile, and is composed of very light sandy loam extending to an unknown depth. The rainfall decreases from thirty inches near the foothills to practically nothing in the Rajputana desert.

'Dams have been constructed across the rivers in all cases. These are generally situated close up to the foothills and are from one-half mile to about a mile in length. With only a sandy foundation available, these dams are constructed with a very wide base. The masonry portion of the dam is only about six feet high, and on the top of these are fixed collapsible iron shutters also six feet high. When floods pass down the rivers these shutters are dropped, and the high flood passes over the low masonry dam without any appreciable stop.

'The most important crops are wheat in the cold weather season and cotton in the hot season; the average output of the former being 1,000 pounds (16⅔ bushels) of grain per acre, and the latter 400 pounds of unginned cotton.

'The total cropped area in the Punjab in a year of average rainfall is about twenty-seven million acres, out of which about eleven million acres are irrigated from one source or another, mostly from canals and wells. Out of this eleven million, no less than four million acres are irrigated wheat. These figures may appear large, but it must be remembered that the wheat belt is confined to the northern provinces, and that throughout the length and breadth of India there are many mouths to fill.

'The largest canal thus far constructed is the Chenak Canal, taken out of the left bank of the Chenak River. It commands an area of three million acres, out of which about two million acres are irrigated annually. Its discharge capacity is 10,000 cubic feet per second, but for five months in the year the river supply falls considerably short of this quantity, and during the lowest stage supplies water sufficient for only one-third of the full capacity.

'From the first it was a magnificent success, and now brings in the handsome profit of twenty-four per cent to the Government.

'A double line of rails has now been completed for over 1,000 miles along the Indus Valley from the Punjab to its seaport town, Karrachi. Karrachi itself is spending five million dollars in extending its harbours and docks.

'The construction of these canals has quickened the heartbeat of the country to an extent which was undreamed of by even the most sanguine. The success of the scheme depended on colonization. The land as divided into blocks of 1,100 square feet, containing 27 acres each. This was the size of the grant usually made, and was given free to selected persons. A watercourse system was dug by the Government to lead water to the highest corner of each square so that when the colonist arrived it was quite a simple matter to turn the water on to his fields and immediately to commence cultivation. The cost of water-course construction, which amounted to two-thirds of a dollar per acre, was afterwards recovered from him by instalments.

'In order to give him a good start no water rate was charged the first year and only half rates during the second year.

'Colonization rapidly sprang into popularity and the difficulty the government had was choosing the grantees. Colonists were chosen from those parts of the province where population was most dense. The brave Sikhs, our hardy Mohammedans, were not forgotten and many a soldier who had won honour in foreign lands was

rewarded with his heart's desire, a square of land. The census of 1901 showed that in eight years 800,000 persons had settled on the Chenak Canal.

'On the other canals irrigation has been extended into dry tracts liable to famine, the water supply in the older irrigated tracts being reduced in order to supply the benefits of irrigation to a greater number. This has led to great economy in the use of water. A duty of 170 acres per cubic foot per second of actual discharge at the head of large distributary channels is a good average figure for cold weather crops, such as wheat and barley. The duty is reduced to 100 acres during the hot weather period when cotton and Indian corn are grown.

'In the case of nearly all these canals their capacity is far greater than the minimum supply of water in the river. In several cases at a stage of low water the river supply is equal to only one-third of the designed capacity of the canal. The usual practice at such times is to run one-third of the distributaries at maximum capacity for a certain number of days and then close them off completely. During a time of light demand, therefore, a distributing canal will only be in flow for ten days in the month.

'The cultivators take off their supply of water from the government channel through a watercourse which is maintained by themselves. Watercourses are constructed so as to serve usually from 30 to 40 squares of 27 acres each.

'With the government channel running only ten days in the month it will not be possible for any one cultivator to get more than an eight hours turn once a month, the water being used equally night and day. This does not allow for breaches in watercourses and other untoward accidents. On older canals the land is cut up into much smaller subdivisions with the consequence that shareholders in the watercourse are more numerous and the length of time each shareholder receives water is considerably less than eight hours a month.

'It is probable that the limit of economical distribution has been reached in the case of these older canals and further extensions into dry areas must await increased water supplies.

'Good progress has been made in extending irrigation; during the last ten or twelve years an average addition of one-third of a million acres a year has been made to the irrigated area of the country. This has been done at a capital cost of but $5 an acre, and large valueless tracts of government land have thus been reclaimed. Alexander the Great passed through some of these tracts in the fourth century B.C., and found them covered with scrub jungle, just as they were some fifteen years ago, and infested with robber bands, just as they have been lately. These lands cannot now be bought for less than $40 an acre, and the produce for one year equals the capital cost of the canal.

'Water rates vary from one to five dollars an acre; the most highly valued crops being sugar cane and rice. Water rates on wheat and cotton land vary from $1.50 $2 per acre. The average rate over the whole cropped area is about $1.50 an acre.'

The following resulution was moved by Mr. W. H. Fairfield, and seconded by Mr. C. W. Peterson:—

Location of Agricultural College for Alberta.

Whereas, arrangements are now being made for the establishment of a University in the unirrigated part of the Province of Alberta, and

Whereas, a proposal has been submitted to locate the Provincial Agricultural College in conjunction with the said University; and

Whereas, the far-reaching importance of agriculture under irrigation demands imperatively that proper attention be paid to this subject in the curriculum of the said Agricultural College, and

Whereas, such would be impossible if the college farm were not so located as to make it possible to conduct demonstration work under irrigation, thus giving students an opportunity to study the practical side of the artificial application of water, and

Delegates attending the first Irrigation Convention of Western Canada, Calgary, Alta., July, 1907.

Headgates, Main Canal, C.P.R.

Headgates, Secondary Canal A. C.P.R.

Deep Cut, Main Canal, C.P.R.

Whereas, under the climatic conditions of the Province of Alberta, agricultural demonstration work without the aid of irrigation may be successfully prosecuted in almost any portion of the Province, thus making the location of the Agricultural College an immaterial one as regards the interests of non-irrigated lands, and

Whereas, the gravest objections also exist to the principle of associating too closely the administration of agricultural colleges and universities devoted to general educational work:

Therefore be it resolved, that this convention emphatically places itself on record in favour of the policy of having the Provincial Agricultural College for Alberta situated in a district where irrigation by gravity may be practised.—Carried.

In introducing the foregoing resolution, Mr. W. H. Fairfield, of Lethbridge, said: 'Where an Agricultural College is established in conjunction with a university, the agricultural studies are not given the same attention as are other subjects, and I am of the opinion that the province can well afford to keep up one institution of learning, separate and apart from the university, devoted to the farmers' boys. The most skilled farmers in Canada and a large percentage of the leading agricultural experts of the United States are graduated from the Agricultural College at Guelph, Ontario, which is maintained as an absolutely separate institution.'

Mr. C. W. PETERSON, Calgary.—'An agricultural college should be located where irrigation is available. It is important that in any steps the Government may take toward establishing an agricultural college, the subject of irrigation farming should be given a prominent place. Experiments and object lessons without irrigation can be provided on the irrigated farm with the same facility as in a purely "dry" district, while if this institution is located in a "dry" district all instruction bearing on irrigation must be abandoned. In view of the millions of dollars invested in irrigation enterprises, and the fact that at least one-third of the agricultural productions of Alberta will be upon irrigated land, I maintain that the duty of the Government is to locate the provincial agricultural college in an irrigated district.

'The folly of establishing an agricultural college in conjunction with a provincial university is so apparent that little or no argument is necessary on the subject. The farmers of this province have a right to demand a school of agriculture that will not be hampered by pedantic schoolmasters and controlled by a board absolutely out of touch and sympathy with agricultural development and progress. This continent does not contain a single instance where such an unnatural alliance proved successful. The agriculture department would soon be subordinated to the demands of other branches, and would finally develop into a fifth wheel to the academic wagon.'

Mr. WILLIAM PEARCE, Calgary.—'Primarily the Agricultural Department of the Guelph College in Ontario was in conjunction with the University of Toronto, but in view of the fact that the agricultural studies were not given as much prominence as those devoted to other professions, that department was taken away from the Toronto University, and an agricultural college was established at Guelph, Ontario.

'In the event of an agricultural college being established in Alberta, it is an absolute necessity that such an institution should be located in the irrigated district, for the reason that if agriculture should be taught in a non-irrigated portion no knowledge whatever of irrigation would be gained by the students.'

Mr. A. E. CROSS, Calgary.—'In the Guelph Agricultural College one-half of the time is devoted to actual agricultural work and the other half to talks and lectures. The tendency in colleges is to go into educational work and not practical work. When boys are taken away from the farm it is found to be difficult to get them to resume practical farm work.'

Mr. THOMAS H. WOOLFORD, Cardston, Alta.—'An agricultural college should not be in conjunction with a university whether in an irrigated district or not. Agricul-

ture is, and will be for some time to come, the principal work in Alberta, and for that reason the subject should be treated seriously. In my opinion it is essential that the agricultural college should be established in one of the irrigated districts.'

INDUSTRIAL DEVELOPMENT FOLLOWING IN THE WAKE OF IRRIGATION.

(By C. W. Peterson.)

To the Chairman and Members of the First Western Canadian Irrigation Convention.

Mr. Chairman: I have been asked by the Committee on Arrangements to prepare a paper on 'The Industrial Development following in the Wake of Irrigation.' While I am not technically qualified to deal with this subject, I will submit a few brief observations.

It is evident that the industrial development of any particular section will depend very largely on its climatic conditions and potential resources. The industrial development incidental to irrigation or intensified farming in southerly latitudes would therefore to some extent differ from that of northerly latitudes. As the area represented in this convention falls within the latter, I shall confine myself to dealing with industries that lend themselves to development with the raw materials and under the climatic conditions of the three westerly provinces of Canada.

IRRIGATION AND CONSUMPTION.

In discussing the industrial development as a result of irrigation, it is well to bear in mind that the bulk of industrial investment invariably locates tributary to the consuming population, other things being equal. This means that density of population, which creates favourable market conditions, attracts industrial enterprises manufacturing products required by such population. This refers, of course, particularly to the hundred and one manufactured articles required upon the farm under intensive culture.

Irrigation means small holdings and a dense rural settlement, and, furthermore, a prosperous and heavy consuming population. Such being the case, the industrial development of any irrigated section is by no means confined to branches of industry requiring for raw material the products of the soil.

LIVE STOCK FEEDING AND FINISHING.

While it may be considered that my subject confines me to urban industries, I cannot resist the temptation of saying a word or two on agricultural development, as I conceive the farm to be the nation's greatest workshop.

In studying the economic side of irrigation, the first fact that must be thoroughly grasped is, that the backbone of a successful farming community is not by any means the production of either fruits, cereals or vegetables, but the feeding and finishing of live stock. This has been the history of irrigation development in every state in the Union from the most southerly to the most northerly. The proof of this contention is, that of the total irrigated acreage in the United States at the time of the last decennial census, sixty-four per cent was in hay and forage crops. The actual figures are, total 5,712,000 acres; in hay and forage 3,666,000 acres. Cereals occupied 24 per cent, fruits 4½ per cent and vegetables 3 per cent of the whole. The popular belief that irrigation is not a practical proposition in latitudes where fruit cannot be grown and where a ready market of large proportions does not exist for the side issues of the irrigated farms is, therefore, evidently a fallacy. In the state of Colorado, with an irrigated area of 1,500,000 acres, only 35,000 acres are devoted to fruit growing, while over a million acres produce hay and forage, principally alfalfa. This is conclusive proof that live stock feeding and finishing holds its own successfully

against fruit growing in a state where the latter can be prosecuted with the greatest facility and profit.

Owing to the fact that the Provinces of Saskatchewan and Alberta will probably never lend themselves to fruit growing on a large scale, while conditions are almost perfect for live stock husbandry, it is reasonable to suppose, that the extension of irrigation enterprises in these two provinces will simply revolutionize the live stock business. Instead of sending cattle and sheep to market half finished, they will be grain-fed when marketed This will also insure the marketing of our live stock during every month of the year instead of, as at present, confining it to two or three months in the autumn. Immense numbers of hogs will also be raised and fattened, and the western prairie section will become an enormous ham and bacon exporting instead of importing country.

Even the Province of British Columbia with its excellent local market for agricultural products will probably find it more profitable to grow stock feed on a large area of its valuable irrigated lands than to devote them entirely to other crops commanding a higher money value per acre but requiring a larger expenditure for labour.

MEAT PACKING AND KINDRED INDUSTRIES.

The irrigated area is the natural live stock feeding and finishing section, and cities tributary to such become the logical marketing and packing centres. The history of the packing industry in the United States has been an irresistible progress westward. The 'Chicago' of Canada will be west of Lake Superior. The 'Kansas City' in the irrigated portion of Alberta.

While with our limited live stock production, we cannot hope to have more than one or two giant packing houses in the West, we may confidently look forward to the establishment in every centre surrounded by irrigated lands of large pork packing industries. Alfalfa-fed pork finished with a small grain ration produces perhaps the finest quality of bacon and hams and is one of the staple products of the irrigated farm with its rich alfalfa fields and abundant supply of coarse grains.

FRUIT GROWING.

There can be no doubt that the introduction of irrigation in the valleys throughout British Columbia will wonderfully stimulate fruit production there. That province will always have a ready market in the prairie section, as it is improbable that the more tender fruits will ever be produced East of the Rocky Mountains.

It is more than likely that varieties of the hardier fruits will very soon be developed that will grow under irrigation in the prairie section, but crops vastly more profitable to the average farmer will claim the attention of irrigationists, thus leaving the field clear for the British Columbia fruit grower.

Strawberries will undoubtedly be produced in great abundance anywhere in Alberta or Saskatchewan where water is available. In fact, this has been conclusively proven in the Lethbridge District now, and the prediction has been freely made that the Medicine Hat and Maple Creek Districts will grow fruits of the more tender varieties.

DAIRYING.

This industry is one that involves the creation of urban enterprises to handle the product of the farm. It would prolong this paper to deal in detail with the various branches of dairying. Suffice it to say that the irrigated district is the ideal home of dairying industries, including creameries, cheese factories and evaporated and condensed milk plants.

The enormous capacity of irrigated lands for the production of succulent foods of all descriptions, renders it plain that dairying is bound to become one of the greatest factors in any system of farming under irrigation. It is appropriate to

remark just here that the history of agriculture has been, that no country ever reached the highest point of agricultural development until dairying became the leading occupation of the farmer. Dairying is the corner stone of intensified farming.

The labour problem stands in the way of dairy development in our western country at the present time, but the irrigated lands, particularly of the Province of British Columbia, are bound to be devoted largely to dairying. Our market conditions are of so favourable a nature that means must ultimately be devised whereby the labour difficulties will be overcome.

BEET SUGAR PRODUCTION.

Sugar beet culture is rightly considered a leading feature of irrigation farming. The northerly latitude of Canadian irrigated lands, with the long cloudless days, increases the activity of the chlorophyl cells of the beet leaves, which elaborate the saccharine, so that a greater quantity of sugar is formed in proportion to the area of leaf surface. We have, therefore, a climatic or geographical advantage over our southern competitors in sugar beet culture.

Few countries can compete with Western Canada in the production of sugar, and it is confidently expected that agricultural and industrial history will be written when the proper cultivation and treatment of beets in this latitude is once thoroughly understood and practised. Coal is found everywhere, at least in districts where sugar beet growing is likely to be prosecuted on a large scale, and enormous limestone deposits are available on the eastern slope of the Rocky Mountains.

The value of a sugar factory to a community need only be incidentally referred to. The era of 'sugar towns' has dawned in Western Canada, and with the enormous extension of irrigation, our manufacturing capacity of this commodity will only be limited by our market requirements, which promise to become enormous in view of the unprecedented influx of population into the prairie section as well as the Pacific Province.

TEXTILE INDUSTRIES.

It is a well known fact that the production of flax for fibre is now confined to countries of considerable humidity, as sub-humid or dry climates do not produce the best quality of fibre. The introduction of irrigation is liable to change the aspect of affairs considerably. Not alone may flax be profitably grown for fibre, but hemp may also become a valuable product. This would lead to the development of textile industries in the vicinity of irrigated areas where the raw material will be produced.

SCOURING MILLS AND WOOLLEN MILLS.

Such enterprises will also be familiar adjuncts to irrigated sections. The vast stock-feeding industry that will undoubtedly develop with the production of alfalfa and other forage crops will greatly stimulate sheep feeding, and, consequently, wool production. The greatest wool-producing state south of the line to-day is the State of Montana, and the irrigated valleys of that state finish from one-fourth to one-third of a million sheep annually on alfalfa.

MALTING.

The famous Gallatin Valley, in the State of Montana, is the premier malting barley-producing section of the civilized world. This barley is raised almost entirely under irrigation, is shipped all over the world and is highly prized for malting purposes. The bulk of this barley goes to the continent of Europe.

One of the largest malting concerns in the world has a standing offer of ten cents per bushel over and above the market price for any barley fit for malting produced under irrigation in Western Canada. The tendency should, however, be to establish

malting plants at the point where the barley is produced, and ship it to the various breweries, rather than to marketing the raw product.

CEREAL MILLING.

The soft wheat so plentifully produced on irrigated lands, the enormous crops of oats and barley that will follow the introduction of irrigation, will draw cereal milling industries to the towns tributary to the irrigated sections. The question of freight rates on the raw material is one of great importance to industries such as these, where such material is bulky and of small value per pound. The tendency of industries of that sort is to locate in the centre of the greatest cereal-producing district.

An irrigated district holds out special advantages inasmuch as crop failures or partial failures will practically be unknown, and any industry establishing a cereal mill in the vicinity of irrigated lands will not, therefore, be face to face with importing raw material in years of partial or complete local crop failure such as occur periodically even in the most favoured non-irrigating sections of the world.

VEGETABLE CANNING.

An industry that will lend itself especially to location in the vicinity of irrigated sections is that of vegetable canning. A million and a half pounds of peas are canned annually in the State of Colorado, and one hundred and thirty-one million pounds in the United States. Green peas can be produced in abundance with artificial watering, and machinery has now been perfected whereby the harvesting and shelling of these peas can be accomplished with the smallest amount of hand work. An enormous market for canned peas exists all through Western Canada, and any industry of that nature will have the benefit of freight rates from Eastern Canada on competitive products, and almost an unlimited market locally.

STARCH.

The production of potato starch will be an industry of value on irrigated lands. Large sections of Colorado are devoted almost entirely to potato production under irrigation as a leading crop. The appliances for extracting the starch from potatoes are inexpensive, and the by-product, potato slop, is extremely valuable for the feeding of stock.

CONCLUSION.

I have touched only briefly upon the industrial possibilities of irrigated sections and scarcely at all upon the various new crops that may be produced under irrigation. Time does not permit of any exhaustive address upon the latter phase of irrigation.

Let me but add in conclusion, that the 'dark ages' when irrigation was regarded purely and simply as a means to reclaim desert areas, have long ago passed into oblivion. The new agriculture demands the same degree of certainty in forecasting results as is demanded in all other lines of production. Irrigation makes this a practical possibility. The arch enemy of the farmer in every portion of the civilized globe is drouth. This is true in humid sections as well as in the drier belts. What would become of the gardens, lawns and trees in our cities in the East as well as in the West without an artificial water supply? What is good for the lawn is equally good for the farm. Irrigation farming is advanced agriculture. It is more. Irrigation farming is business farming, and those sections of our Great West that are favoured with an abundant water supply available for irrigation ought to utilize every gallon thereof as speedily as possible and should never cease to praise God Almighty for his bountiful gift.

The following resolution was moved by Mr. Wm. Pearce, and seconded by Mr. J. A. McDonald:—

Extension of Surveys in Connection with Irrigation.

Whereas, the permanency of all irrigation development is dependent upon an accurate knowledge of the location and quantity of water supply available; and

Whereas, the matter of the topographical and hydrographical surveys to determine the location and quantity of such water supply and the proper methods of conserving it must be undertaken by the governments administering the law relating to the use of such water:

Therefore be it resolved, that this convention, while recognizing work already done, urges strongly upon the Dominion Government and the Government of British Columbia the importance of making the necessary appropriations and providing the necessary staff to undertake in an intelligent and systematic manner the gauging of all streams of water supply and the location and survey of all sites suitable for reservoirs for the storage of water.—Carried.

Mr. Wm. Pearce, of Calgary, in introducing the foregoing resolution, said:—'The time is coming when every drop of water flowing from the Rocky Mountains will be utilized. It is the duty of this convention to lay plans to utilize the water to the greatest advantage. It is estimated that the volume of the Bow River is about 140,000 second feet for twelve months, which would be an average of nearly 12,000 second feet per month. But as the irrigating season is only about three months per year it is impossible to estimate accurately the volume of water available without storage. It is almost absolutely necessary that the authorities of the Dominion Government who have charge of this water should proceed with a complete topographical survey of our streams, also, a thorough hydrographical survey, and that the Provincial Government should assist in storing the water. From the surveys which have come under my notice, it is most encouraging to find that the facilities for storing water are very good, especially in places where the best results are not expected to be obtained.'

Mr. R. H. CAMPBELL, Ottawa.—'It is my idea that the Government should take the most active steps at the earliest possible time to discover what the supply of water is, and the best methods for storing that supply. I would call attention to the fact that a certain amount of work has been done by the Dominion Government in that direction already, and when the work of irrigation was under the charge of Mr. Dennis, considerable work was done in gauging streams. Surveys were also made for the purpose of ascertaining where the best reservoirs could be placed for storing water, but I do not think the work has been done thoroughly enough. Irrigation surveys did not proceed so actively after Mr. Dennis resigned until Mr. Stewart took the matter up after his appointment. He has been impressing on the department the necessity for carrying out the gauging of the streams and has started systematic work. I think the Dominion Government should employ more men and spend more money in this work in order that the best results may be obtained at the earliest possible moment.'

Mr. WM. PEARCE, Calgary.—'Up to the present time nothing has been done along, what I consider, the most important line in storing water, that of storing water at the source of a stream.'

Mr. J. A. MACDONALD, Rossland, B.C.—'This resolution strikes right at the root of irrigation, and to arrive at a satisfactory conclusion we must commence at the beginning of the resolution, viz., the quantity of water available and the means of utilizing the same. The Government of British Columbia has recently appropriated $5,000 towards a commission for this purpose, and this commission is to employ one man who is an expert on irrigation, and they hope to have every drop of water which is going to waste used in irrigating arid lands.'

The following resolution was moved by Mr. A. E. Ashcroft and seconded by Mr. Thos. Woolford:—

'Whereas, the Federal Government owns a large extent of territory in the Provinces of Alberta and Saskatchewan and in British Columbia, capable of enormous development by the installation of extensive irrigation works, which are beyond the reach of private enterprise, therefore be it resolved that this convention desires to urge upon the Federal Government the desirability of making sufficient appropriations towards the construction of subsidizing of such irrigation projects as surveys shall prove feasible.—Carried.

Mr. ASHCROFT, of Vernon, introducing the foregoing resolution, said:—'In view of the fact that the Federal Government is very largely interested, and owns large tracts of land in the Provinces of Alberta, British Columbia and Saskatchewan, that may be brought under cultivation by irrigation, I feel that they should be largely interested in development along these lines. The undertakings I have in mind are so vast that it would be utterly impossible for any private company to handle them, and they can be dealt with only by the Government itself.'

SOME PROBLEMS OF A BRITISH COLUMBIA IRRIGATION PROJECT.

(By A. E. Ashcroft.)

The 'Dry Belt' of British Columbia is a term applied generally to the region lying north of the international boundary and east of the Cascade range of mountains, with somewhat indefinite boundaries towards the north and east. It comprises the valleys of the Similkameen and Okanagan, Middle Fraser, North and South Thompson and Upper Columbia Rivers, and the small streams tributary thereto. We say 'valleys' advisedly, for, though on the lower levels the precipitation throughout this area does not exceed, and generally falls far short of twenty inches annually, on the hills and high plateaux enclosing these valleys, it frequently reaches as high as in the humid coast districts, occurring chiefly in the form of snow during the winter months. These conditions entail the most varied and unequal flow in the streams and watercourses at different periods of the year—high floods in the spring and early summer shrinking to paltry rills or completely drying up as the season advances. These causes, as well as the friable nature of the soil, have operated for ages in deepening and depressing the channels of the streams, leaving 'benches' or 'mesas' as they would be termed in the Southwestern States many hundreds of feet above the rivers of whose valleys they form a part. These benches are seldom in large continuous areas, and the problem of constructing irrigation works for their reclamation is rendered more complicated than in the localities where one large stream can be utilized to cover a great extent of prairie.

In the Okanagan Valley the suitability of the soil and climate for growing fruits and other special crops has been recognized for years, and in the few favoured localities where water was easily obtainable great advances in this direction have been made. One of the most successful undertakings is the well known 'Coldstream Estate' owned by the Earl of Aberdeen and associates. Under the management of Mr. William Crawley Ricardo this estate has been developed from an indifferent cattle ranch into a highly specialized farm where fruit, hops, and vegetables are grown on a commercial scale, a large nursery for young trees is established, crops of grain and hay harvested annually and cattle and horses of a high quality are bred. All this has been accomplished by means of irrigation, the waters of the stream flowing through the estate being diverted by ditches on to the lower levels of the property. Years ago Mr. Ricardo recognized that if he would increase the area developed he must find a way to conserve the spring run for use in the late summer, and a remarkably efficient system of storage was obtained by building a dam across the outlet of a small mountain lake about 12 miles to the south of the homestead and situated about

2,500 feet above the valley. Four years ago a portion of the estate was subdivided into 20-acre lots and an irrigation system constructed to cover the subdivision (about 1,000 acres) which is fed entirely by the water thus stored. These lots are all now settled and planted out in fruit. The success thus obtained directed Mr. Ricardo's attention to securing a further supply to cover other parts of the estate not reached by the existing system, and four years ago he directed surveys to be made to ascertain the feasibility of bringing the water of Jones Creek, one of the head waters of the Shuswap River, and rising in the same plateau where the lake already utilized is situate, on to the higher levels. The plans called for the construction of 10 miles of canal through a hilly and timbered country and the damming of two lakes in the mountains to ensure a late supply of water. The cost was estimated at $50,000, to cover 2,000 acres of the Coldstream Ranch, and 2,000 acres of lands intervening. As these latter were in private hands, the owners of which did not at first look favourably on the scheme, the plan was adopted of forming a company to build the works, the shareholders in which were the owners of the Coldstream Estate. This was done to acquire the benefits of Part 4 of the Water Clauses Consolidation Act of the Province. As an illustration of the position of irrigation on the statutes of British Columbia, the company was advised that it could only exist legally as a 'Power Company,' and the title adopted accordingly was 'The White Valley Irrigation and Power Company.' This is one of the earliest irrigation companies to be incorporated in the province, and their legal advisers had to break much new ground in preparing the charter. By the time actual construction work was started, in the spring of 1906, it became evident that the scheme was capable of great extension, there being about 6,000 acres of splendid land lying round the town of Vernon, below the Coldstream Ranch, which could be served by the system if it were built on a large enough scale. A purchase and consolidation of two large cattle ranches by a Belgian syndicate facilitated negotiations, and arrangements have been entered into by which these lands contribute to the cost of the works; the capital has been increased and work on the full scheme to cover 10,000 acres is now being vigorously proceeded with. An ample supply of water is assured, there being a watershed of 150 square miles at an elevation of 4,500 to 5,500 feet, and well covered with timber, tributary to the storage reservoirs the larger of which, Lake Aberdeen, is 1,000 acres in extent and will have a capacity of 12,000 acre-feet, and the smaller one of 600 acres, and will impound 4,000 acre-feet when constructed. The canal headgates are situate 12 miles down the stream from the outlet of the lower lake at 2,170 feet above the sea, and the main canal, six miles of which are already constructed, measures 14 feet across the bottom, side slopes 1 to 1 with a grade of 5·28 feet per mile. It will carry 150 second feet for the first 8 miles, reducing in capacity as the area below it to be served diminishes. A special feature of the system is the pipe line by which the water is conveyed across the White valley six miles above the Coldstream ranch. This pipe line is 6,300 feet long with a difference in elevation of the two ends of 157 feet and a head of 330 feet at the lowest point. Wooden stave pipe is used and one of 24 inches diameter is already installed and it is the intention to build another one alongside, of 36 inches diameter in 1908. Just before the water enters the pipe a diversion is made by a flume and small canal 7 feet wide which is carried along the south side of the valley for 5 miles and empties into the stream, draining the small storage reservoir already in use above the point where the water is taken for irrigating the subdivision alluded to above, thus reinforcing the existing system completely.

One of the problems in connection with this project arises out of the incompleteness of existing legislation on the subject of stored water, and the uncertainty of the status of prior but unused records from the same source. In Colorado stored water has been ruled by the Supreme Court of that State to be a chattel and transferable as such. For 'power' purposes the British Columbia law would seem to imply the same, and as a 'power' company a corporation may buy or sell water. An irrigation record by an individual must be made applicable to a specified tract of land and the owner of a ditch can only be a common carrier of the water appurtenant to the lands it irrigates. It was recognized at the outset that the rates to be charged

users of water should be based on the quantity used and not on the areas of irrigable land under the system. The unit of the acre-foot was adopted, and a sliding scale of rates prepared and approved by the government; there is no recognized duty of water beyond the practice of the Government Commissioners granting records of one inch for every acre of land owned by the applicant, irrespective of whether all of the land is physically capable of being irrigated from the specified source, or of the quantity of water available. The schedule of rates was prepared with a view to provide a fair return on the capital invested and at the same time to be low enough to make it a profitable investment for the irrigators to purchase sufficient water to irrigate all the land available. Under a responsible company with a permanent interest in the development and prosperity of the country it is, in the writer's opinion, the best system that could be devised, as the control of the water is in expert hands and economy in its use is encouraged, thereby avoiding the evils of over-irrigation, the effects of which are so marked in some of the Western States. But the principle is open to the grave objection that the ownership and control of the water might be made an instrument of extortion. On the other hand, a too rigid adherence to the principle of making water from a certain source appurtenant to a specified tract of land might hamper future development.

As the subject of government control of the water available for irrigation will be fully discussed by this convention, I will not here enlarge on the point. Another problem that calls for solution is that of seepage; where ditches and canals are carried along more or less steep side hills this will occur in places. It is, of course, to the interest of the company owning the works to prevent and guard against this as much as possible, and the various remedies adopted by engineers will be used, but the experience of other places has proved that after some years of irrigation the lower lying lands will require under draining. In the particular project under notice there have been many minor difficulties, shortage of labour, the difficulty of transporting materials and supplies to the dam over 20 miles of rough mountain trail, croppings of rock to cut through, the steepness of the sides of the canyon from which the water has to be lifted, necessitating the constructing of 1,400 feet of flume and the building of cribwork for the bank of a mile of the canal, blowing out of stumps of trees 3 and 4 feet diameter, &c. The pipe line referred to above passes through a cluster of farm buildings and under the abutments of a bridge on the high road. There has been a marked advance in the price of labour and of material such as cement, lumber, iron, &c., the advance in lumber being very marked, and this affects the cost of the wooden stave pipe used. All these causes combined have increased the cost of construction materially since the project was started.

In the existing system on the Coldstream ranch weeds, both on the banks and growing in the water are giving considerable trouble and this nuisance will call for special measures to be taken in the larger work. Sowing the banks with a special grass has been considered but the actual measures to be taken have not yet been decided on.

The cost will approximate $20 per acre for the lands benefited, and it is estimated that about 20,000 acre-feet will be required annually when all the lands are brought under cultivation.

The greater part of the land will be held in small blocks of 20 to 30 acres, requiring an intricate system of distributing laterals and flumes. Cippoletti weirs will be used for measuring the water, with self recording registers. All this will require a considerable field and office staff. Unlike the majority of the large irrigation projects of the Northwest, the White Valley Company looks only to the revenue to be derived from the sale of water for its returns, and will not derive its profits from the sale of land. The total length of its main canal will be 30 miles, and in order to bring the best of the land under irrigation at the earliest possible date, this canal must be pushed forward to the head of the Okanagan lake. A large sum must be set aside annually after this is done for betterments, additional storage works, rebuilding of flumes or replacing them with concrete channels, &c., &c., and it will be some time before sufficient water will be sold to put the company on a dividend earning basis.

The following resolution was moved by Mr. M. S. Wade, seconded by Mr. M. Woolf:—

Agricultural and Horticultural Experiments and the use of Water on the Irrigated Farm.

'Whereas, it has been demonstrated beyond doubt that the utilization of our streams for irrigation purposes will ensure to the farmer a larger average crop per acre over a given number of years; and

'Whereas, irrigation under new climatic and soil conditions gives birth to agricultural and horticultural problems that can be solved only by systematic investigation and experiment; and

'Whereas, through the development of vast irrigation projects in Western Canada, thousands of settlers are now colonizing our irrigated lands, who are not only unacquainted with our climatic and soil conditions, but who are also frequently ignorant of the principles of irrigation farming:

'Therefore be it resolved, that the Dominion Government and the Provincial Governments of Saskatchewan, Alberta and British Columbia be requested to make adequate appropriations for experimental work under artificial watering and for the dissemination of useful information bearing on the subject.'—Carried.

Mr. M. S. Wade, of Kamloops, in introducing the foregoing resolution, said:—'Nothing will so quickly give to new settlers and those new to the idea of irrigation an understanding of that system of agriculture, as will experimental work along lines furnishing a practical demonstration of its application.'

AGRICULTURAL AND HORTICULTURAL EXPERIMENTS IN THE USE AND DUTY OF WATER ON THE IRRIGATED FARM.

(By W. H. Fairfield.)

My subject is certainly broad enough to give ample material for this short paper, when one stops to consider that the United States Department of Agriculture at Washington, together with the experiment stations of the Rocky mountain States are spending hundred of thousands of dollars in carrying out investigations along these lines.

If this subject is of sufficient importance to call for the expenditure of such vast sums of money in the United States, surely the time is fast approaching, if it is not already here, when our own government will have to give these problems pertaining to this subject serious consideration.

As you are perhaps aware, no work has been done in Canada up to the present time, relative to determining the duty of water as used on the various farm crops.

It is not the intention in presenting this paper to give a mass of information gleaned from the results of investigations carried on in the States, but, it is, rather, to attempt to point out the importance of such works in our new irrigation districts on this side which are but just starting to develop.

As the general principles of farming are applicable the world over, just so are the general principles of irrigation applicable wherever irrigation is practiced. However, local conditions such as soil, climate, and kinds of crops raised modify the practices, as well as results.

We are in a position to profit a great deal from original investigations which have and are being carried on in the western states, especially as conditions in the bordering States, as well, possibly, as points of higher altitude farther south, are in many ways similar to our own. This means that we will probably never have to duplicate all the work that is being done there, while, on the other hand, it will be necessary for us to verify their results under our own conditions, which are unique in various ways. And, because we have unique conditions, as has every other district

of considerable area, we have problems to solve for ourselves. Among the several factors that go to make our conditions peculiar, there are two which stand out pre-eminently. One is our annual rain fall, which is greater than is usually the case where irrigation is practiced, and the other is our short growing season which means a short irrigation season.

A greater precipitation means an increased duty for the water, or in other words, a given volume of water will serve a larger area of land than where the rain fall is less.

I have been led to believe that it was due to this fact along with certain other conditions that the present duty of water for Alberta and Saskatchewan was fixed as it is, which is, as most of you are aware, one second foot continuous flow for one hundred and fifty acres of land. At the time that the duty of water was thus fixed, there was no data at hand by which to be governed, as so little irrigation was being practiced at that time in the Northwest Territories. Although since that time considerable irrigation development has taken place in Alberta, there is still no data available along this particular line. Even under the Alberta Railway and Irrigation Company's ditch near Lethbridge, where there is more land actually being irrigated than in any other locality in the province, practically no attempt has as yet been made to measure the water to the individual farmer. Consequently, it is readily seen that no one is in a position to say whether the present duty of water for Alberta is too low or too high. And it is certainly not my intention to express an opinion on this point to-day. However, from my six years experience as a farmer on an irrigated farm in Southern Alberta, there are certain conditions that I have observed which lead me to believe that there will be problems in the use of water here that may have a direct effect on the duty. I refer to the fact that the nominal irrigation season is from May 1 to October 1, but the actual irrigation season, with rare exceptions, is not so long. With ordinary crops, such as alfalfa and grain, it is not usually wise for us to irrigate until well along in June. Thus the water during May and a part of June is of no particular value to the farmer, while, on account of the growing season being short, the period when the first irrigation for alfalfa should be given is almost identical with the time when grain should be irrigated. There are, of course, grasses which may be irrigated to advantage in May, but the point I wish to bring out is that June and July are the months when the major portion of the water must be used with ordinary crops to get returns during the correct season.

The average size of the irrigated farms of Southern Alberta will probably not exceed one hundred and fifty to one hundred and sixty acres. Then taking the case of the individual farmer, the size of the irrigating stream to which he is entitled will be one cubic foot per second. With a flooding system, which is the one in vogue here, it is not practicable for a farmer to irrigate grain or alfalfa with a stream of no greater volume than one second foot. It is generally admitted among practical irrigators that it requires a stream of two to three second feet with which to flood-irrigate land. For, with any less than this amount, the ordinary irregularities of the surface of the soil left from ploughing, &c., obstruct the flow of the water to such an extent, together with the fact that such a small quantity is really applied to the land, that the progress made by the irrigator is so slow that it does not pay him to spend his time watching or directing it. This difficulty is easily overcome by his exchanging water with his neighbour and thus irrigating, say only one day in three, but should a farmer's crop be such that to get maximum results he must irrigate them all, say between the 10th of June and the last of July, he will have to be a very careful farmer indeed, if he can flood-irrigate one hundred and fifty acres of land in that length of time with one second foot of water flowing continuously. Of course it would be entirely out of the question to irrigate his crop in the proper season if it consisted entirely of grain. We assume that the irrigation farmer will plant a diversity of crops and that alfalfa will be a leading one, but even with a range of this kind, it is going to require careful planning to so arrange his crops that they will come on in such a way as to require irrigating successively and not at the same time.

It is to the interests of all concerned that what water there is be made to serve

the greatest possible area of land, and every effort to increase the duty of water rather than to reduce it is commendable. It is important that the irrigation farmer should view the subject from this standpoint. What is to be feared is that without having carefully arranged his farming operations and arrangement of crops so as to be able to make good use of irrigation water for the entire season from May to October, he will discover that he can irrigate to advantage only for a short time, possibly in June and July, and, having too large an area to water in this length of time with the quantity available, he will have a large portion of his crops suffer.

It has been found that late fall irrigation can be practiced with much profit. This is particularly so in the case of all kinds of hay, for by having the soil of the hay meadows go into the winter in a good wet condition, the plants do not suffer from loss of vitality due to drying out during the winter; and in the spring the ground being still moist, the crops do not suffer from the lack of rain and from the drying winds that we are apt to have during April and the early part of May. With alfalfa a particular advantage derived from irrigating it in the fall, after the last crop has been taken off, is that it requires no watering until after the first cutting is made, for an application of water during our cool spring weather often has a tendency to check rather than to accelerate the growth of the alfalfa.

Winter wheat apparently may be irrigated to advantage in the fall, and thus the necessity of any spring or summer irrigation is avoided. Irrigating stubble land will supply the necessary moisture, which is often lacking, and so make fall ploughing profitable, as well as storing a large amount of moisture in the soil for the following year's crop.

These things are mentioned to illustrate a few of the ways by which the actual irrigation season may be lengthened.

In regard to the economical use of water, there are many factors that may be considered. Some of the causes for the waste of water that may be mentioned are,—poor preparation of the surface of the soil, laterals improperly located and poorly constructed, carelessness of the operator himself, and over-irrigation, or allowing the water to remain too long in one place. Fortunately mistakes of this kind soon remedy themselves.

One feature in regard to the methods of the irrigation farmer that will have a great tendency to economize water and which will have a still greater effect so far as his yields are concerned, is something that he has so far paid but little attention to. I refer to the scientific culture of the soil. With an average rainfall in Southern Alberta, sufficient in the majority of seasons to produce good crops of grain, if the land is properly tilled, it can be readily seen that we have a condition that is not common in irrigated districts, and which has an important bearing on the duty of water.

The one great advantage that the advocates of scientific soil culture have claimed for their methods in semi-arid districts has been the conservation of moisture. From this standpoint it has not particularly interested the farmers on irrigated farms. As an actual fact the increased fertility of the soil resulting from scientific culture is of even greater importance than the mere conservation of the moisture. Sufficient emphasis has not been given this point, for one finds the impression quite prevalent among irrigation farmers that it is not so necessary to be particular about cultivation where irrigation is given. That is, that irrigation will to a certain extent take the place of cultivation. This idea has a very harmful effect in a district; for, as an actual fact, the reverse is more apt to be true. However, this mistaken idea will be corrected in time, and as he learns to cultivate with an eye to increasing fertility he will, of necessity, be conserving moisture, which will in turn make less irrigation necessary.

Although there seems little doubt but that grain farming can be carried on successfully in this end of the province without irrigation, still forage crops are not so successful. Just as alfalfa has finally become over fifty per cent in the irrigated regions to the south of us, so it will probably be in time here. Prophesying is an

uncertain business at best, but knowing that alfalfa will thrive as it has been demonstrated that it will under our conditions, we are fairly safe in believing that it is destined to be the leading crop on our irrigated farms. Grain will always be grown to a certain extent, and is bound to be an important crop for some years to come, as the land must be under thorough cultivation before alfalfa can be successfully sown.

The point that interests us is that in seasons when grain has to be irrigated the alfalfa crop will require water about the same time. With alfalfa our short season makes it imperative that we keep the soil moist, for if it should become dry, for any extended period, we will not get the usual number of cuttings. In our long summer days which are composed of so many hours of daylight and sunshine, plant growth is rapid, and it is due in great measure to this fact that crops mature in shorter season than will the same crops farther south. (I refer particularly to grain). It follows then, that if a crop is developing in a shorter length of time, then the period in its life when it may be irrigated to advantage is relatively shorter. This considered in conjunction with the fact that all varieties of crops are growing most rapidly at the same time makes it evident that the major part of the irrigation water for the season might be required at certain periods in the season, and not continuously.

What I have been trying to lead up to by these somewhat rambling remarks is this: owing to various causes, including a fairly good rainfall, the duty of water here has been placed rather high. A high duty under the present system of delivery means a small amount at one time. To utilize this small volume crops must be planted wherever possible in such manner that they will not all require to be irrigated at the same time, but allow the water to be made use of continuously through the season, also, by the use of late fall irrigation on hay, winter wheat and stubble land. These things all help in utilizing and making the most out of the water supply, but the fact still remains that owing to our short season all varieties of crops are making their most rapid growth at much the same time, namely the latter part of June or during July. Naturally plants use the greatest amount of moisture when they are growing fastest, so, it is but reasonable to suppose that they will require the most water at this time.

The question, therefore, that I wish to raise is whether the duty of water under our present system of supply, that is, one second foot continuous flow from May to October, is sufficient? If not, would best results be obtained by increasing the flow for the entire season or merely for a short time when most required, by possibly making use of small storage systems? It is not alone from the standpoint of the farmer that it is important that these problems should be determined, for the welfars of the ditch companies themselves as well as the entire district is dependent upon the prosperity of the farmer. It, therefore, seems but reasonable to urge that the Government take this matter up immediately and carry on some careful investigations to determine just how much water it will require to irrigate various crops, when this should be done and the amount or volume necessary to accomplish it.

At this time in the early development of the irrigation districts of the provinces, while settlement is still scattered, there is slight chance that any of the farmers will feel the necessity of rigid economy in the use of water, for the ditches are amply able to supply all and more than all the settlers will require for some years to come. But this is just the reason that now is the time for the Government to begin investigations. The experimental farm at Lethbridge is preparing to make careful measurements of all water used on the different crops as well as to carry on varied experiments with different amounts of irrigation on the same crops compared with no irrigation at all.

This, however, is not sufficient. Much valuable data will be obtained, but it would be more reasonable to be governed by results obtained thus in regard to the use of water, where the irrigation will be carried on under as ideal conditions as it will be practical to make them, than it would to use the yields obtained from our sixtieth acre plots, as a criterion to govern the yields that a farmer might expect from a sixty-acre or a hundred-acre field.

What should be done is to have careful measurements made of the water used by different individual farmers under varying conditions of soil, crops, as well as slope or lay of the land, at different points in the province. And, most important of all, these will be continued for a number of seasons. For to obtain reliable information we must have the average results for a number of years. Therefore, if the duty of water is too great, the sooner the fact is demonstrated the better. If the duty is correct and we must merely change our methods to be able to get maximum results. This fact can be learned none too soon.

As I have said before, I do not profess to be in a position to express an opinion as to whether the duty of water should be changed, but I will say most emphatically that we are woefully lacking in data along these lines, and the sooner information is gathered the sooner will we be in a position to avoid much misunderstanding and possibly material loss when the time comes for the water to be carefully measured out to each farmer.

Upon motion of Thomas Woolford, seconded by J. T. Hall, the convention was adjourned to 8 p.m., July 17.

The Chairman called the convention to order at 8 p.m., and the following resolution was moved by Mr. M. S. Wade, and seconded by Mr. Christian Jansen:—

Forestry as Affecting Irrigation.—Whereas, the streams in the Provinces of British Columbia and Alberta which supply water for irrigation have their sources in mountains and timbered watersheds; and

Whereas, the gradual melting of the snow and ice on these watersheds which feed these streams and the gradual run-off of the summer precipitation all tend to equalize their flow during the season when water is most required for irrigation; and

Whereas, the destruction of the timber on these watersheds will result in floods in early spring, and a serious shortage of water later in the season when it is most needed for irrigation:

Therefore be it resolved, that the Dominion Government and the Government of British Columbia be strongly urged to take active and immediate steps to reserve and protect the existing forests on these watersheds, and to replant denuded areas at the heads of the streams, so that the sources of water supply for irrigation may be conserved and protected.—Carried.

Mr. M. S. Wade, of Kamloops, in introducing the foregoing resolution, said: 'The experience of the United States, and also that of British Columbia, points to the fact that forest growth should be conserved in every possible way. Last year, realizing the importance of the forests in this regard, the Dominion Government created in British Columbia seven forest reserves, all at water heads, which procedure will prevent people from destroying the timber in any way whatsoever. It is my idea that the Government should replant the timber areas which have been denuded in any manner.

'British Columbia is bountifully supplied with water, but most of it is not available for irrigation. Large streams of water as a rule flow through deep channels which render irrigation work most expensive. Many of the larger streams flow on a lower level than the lands to be irrigated, so that the people in British Columbia are dependent on the smaller streams for water for irrigation purposes. In British Columbia a considerable supply is obtained from Genesin Creek, flowing at an elevation of from five to six thousand feet. During the months of May and June, 1,500 second feet of water goes to waste from this stream, during July about 500 second feet, and during August and September about 10 second feet. In some parts of British Columbia, although fire has gone over the land many years ago, trees and other vegetation are just beginning to grow again.'

CHRISTIAN JENSEN, Magrath, Alta.—'I would suggest that the delegation from Alberta support the delegation from British Columbia in getting storage for water supply.'

WM. PEARCE, Calgary.—'Nose Creek, which has no timber whatever on its banks, discharged in May, 5,000 second feet of water, which cut the banks of the river and washed away part of the railway. If a small stream would do damage to that extent, how much greater would the damage be if a large stream should overflow? Re-forestation would prevent these disastrous floods.'

THOS. H. WOOLFORD, Cardston.—'I would urge that timber be replanted on all denuded areas. That forest reserves be made at the heads of the different streams, and forest-rangers be appointed. Where forest reserves have been made people have been stopped from cutting the timber, and sheep and cattle have been excluded.'

Hon. F. J. FULTON, Victoria.—'British Columbia is not asleep on this question. Up to last year no more than $5,000 was ever voted for the protection of forests against fires, while this year $25,000 has been voted: an increase of fivefold. British Columbia is aware of the necessity of taking up the matter of forestry and replanting denuded and arid areas, and is doing all that is possible to forward matters in that respect. The supply of water depends on the preservation of the forests.'

SOCIAL PHASE OF THE IRRIGATION MOVEMENT.

(By William Pearce, D.L.S.)

When asked to read a paper before this convention on the Social Phase of the Irrigation Movement, it struck me that the assertion, that great benefits would be derived from irrigation from a social standpoint, was so manifest that it was axiomatic to assert such.

This has been frequently the subject of magazine and other articles relating to irrigation, but they have been directed to the notice of those who had not had any experience with or had not given the subject much consideration.

It may, however, be well that this convention should direct attention to this phase of irrigation or its results.

Irrigation settlement, no matter in what lines the application of water be utilized, means very much greater production, therefore the unit of land necessary to support a family is so greatly reduced that the population in any area is by that much increased, which in its turn means schools, churches, social intercourse, &c., &c., greatly facilitated. A very little reflection will convince the most skeptical that those facilities are promoted at a much greater ratio than the increase of numbers; in proportion to at least the square of the numbers if not the cube. To illustrate my meaning: If on the same area in three settlements there are 1,000, 2,000 and 3,000 people respectively, any one will admit that such social facilities are available at least in proportion of 1, 4 and 9, and possibly as 1, 8 and 27.

These facilities will be all the more rapidly forced ahead if the hamlet system of settlement is adopted. The late Mr. Card, one of the founders, if not the chief founder, of the Mormon settlement, in Southern Alberta, stated that for the first four or five years of settlement of his people, those that adopted the hamlet settlement made double the progress of those who settled on their respective homesteads. The Mennonite settlement in Manitoba, one confined wholly to grain growing, emphasized the same conclusions. If that settlement had been an irrigated one, there is no doubt it would have continued almost entirely to this day, upwards of thirty-three years, a hamlet settlement. Being, however, utilized wholly for grain growing, as cultivation increased in area the distance to and from the grain fields became so great that the hamlet system had to a considerable extent to be abandoned. Had they been

confined to intensive cultivation combined with dairying, the hamlet settlement would no doubt have been maintained.

A very little reflection will convince one that in respect to care of milking stock, transport of milk to manufacturing centres, manufacture of butter or cheese, marketing same, an irrigated hamlet settlement can be made ideal. To that might be added the production of eggs, poultry, pigs, lambs, veal and beef, even if the markets for same should be the world's markets. Where these are local markets, the benefits to be obtained from such social conditions are very greatly increased.

It requires no stretch of imagination to picture that in many localities the life giving water utilized in irrigation can, without diminishing in the slightest its value for such purpose, be made to produce power which will by transmission furnish trolley car lines and other advantages, notably in small manufacturing plants throughout a densely irrigated settlement, and thereby furnishing the attractions which have caused so many to leave rural and settle in urban localities.

The great obstacle to keeping on the lands or bringing people out of our villages, towns and cities and induce them to settle in the country, a consumation greatly to be desired, will by irrigation be much the more readily accomplished, the chief objection to rural settlement, partcularly in a new country, being isolation.

Our wives, daughters and many of our sons will no longer desire to leave the home farm and settlement and drift to the urban ones, but life will be rendered so attractive that they will never entertain such an idea. On the contrary the conditions will become so seductive as to bring about the opposite result.

As having a most important bearing on this matter it may be well to direct attention to this: The more intelligence that can be profitably applied to any line of life the higher the mental improvement is affected. Irrigation farming, combined as it is, may and should be, with the attainment of profit whether directly in cash returns or output, in beautification of our homes, in improvements of our buildings must improve the people intellectually, thereby making such life more attractive. If the benefits of irrigation were limited to the growth of trees and shrubs for ornamentation or use it would justify the outlay. That benefit though a very considerable factor, is only a small percentage of the entire benefit that may be gained.

The following resolution was moved by Mr. W. H. Fairfield, and seconded by Mr. Edward Carruthers:—

The Duty of Water.—Whereas, the duty of water, or the amount required for the irrigation of a defined area, has a most important bearing on irrigation development, and

Whereas, the information upon this important question available in any of the provinces of Saskatchewan, Alberta or British Columbia is vague and incomplete:

Therefore be it resolved, that the attention of the governments interested should be directed to this important matter, and they should be urged to take the necessary action to provide for carrying on a thorough system of investigation to determine the duty of water in the different provinces, so that such duty may then be fixed by law. —Carried.

In introducing the foregoing resolution, Mr. W. H. Fairfield, of Lethbridge, said: —'As was remarked by the chairman at the opening of this convention, the duty of water as finally established is going to be one of the determining factors as to the amount of irrigable land we have in Western Canada. Therefore, I feel that the settlement of this question is a matter that should occupy the early attention of not only the Dominion Government, but the Provincial Governments as well.'

The following resolution was moved by Mr. J. T. Robinson, and seconded by Mr. M. S. Wade:—

Laws relating to the use of water and the administration thereof in British Columbia.—Whereas, the law relating to the use of water for irrigation is the foundation upon which all irrigation development must be built; and,

Main Canal, Two Miles below Headgates, C.P.R.

Spillway, Main Canal, C.P.R.

Dam, East End, Sask.

Whereas, the law relating to this important matter in the Province of British Columbia is cumbersome and incomplete in its details, and its administration has resulted in the over-appropriation of water from streams and other uncertainties as to title to water, and is entirely lacking in provisions regarding the storage of water and its subsequent use in irrigation; and

Whereas, the present and future development of important sections of the province are dependent upon the permanency of irrigation enterprises and their extension:

Therefore be it resolved, that the Government of the province be urged to give immediate and full consideration to necessary amendments to the existing law to amplify its present provisions, and to the necessity for carefully revising the existing records against all streams, so as to provide for cancellation for non-user of all records not in good standing, and to fix the priority and quantity of water covered by all records which are in good standing.—Carried.

J. T. ROBINSON, of Kamloops, in introducing the foregoing resolution, said: 'I am pleased to be able to say that the Government of British Columbia has awakened to the necessity of irrigation in our province, and that the ideas set forth in this resolution are among the matters now occupying their attention. I believe that favourable action upon this resolution, by this convention, will come as a well-earned approval of their efforts.'

THE IRRIGATION LAWS OF CANADA AND THEIR ADMINISTRATION.

(By John Stewart, Dominion Commissioner and Chief Engineer of Irrigation.)

Although the principal of the artificial use of water for irrigation has been in use in the United States for years, in Canada the use of water for irrigation has only become apparent within the last few years, when the early settlers in the southern portion of this province had by experience proved that farming without the aid of irrigation was not a desirable undertaking. In the earlier stages of western development there was not much difficulty in convincing legislative bodies of the necessity for the enactment of laws that would govern the use of the water in the rivers and streams for irrigation purposes. The necessary legislation followed almost immediately after the failure of crops in the southern parts of the province, then the Northwest Territories. Laws were then enacted upon the subject of water rights, and these laws have proved a success by the absence of litigation attending the administration thereof. The law relating to the use of water for irrigation is designated 'The Northwest Irrigation Act, 1898,' first passed in the year 1894, and subsequently amended and consolidated in 1898. Prior to the passing of this Act there was no law in Canada except a provincial law in British Columbia which dealt with the diversion of water from its natural channels for use in irrigation, and in framing such a law it was realized that many principles differing from common law must be adopted, and the method followed in framing the law has had much to do with its successful administration. The Northwest Irrigation Act is based upon certain definite principles, which may be stated as follows:—

1. That the water in all streams, lakes, ponds, springs or other sources of supply is the property of the Crown.

2. That the water may be obtained by companies or individuals for certain described uses upon compliance with the provisions of the law.

3. That the uses for which water may be acquired are 'domestic,' 'irrigation' and 'other' purposes; domestic purposes being limited to household and sanitary purposes, the watering of stock, and operation of railways and factories by steam, but not the sale or barter of water, which comes under the head of 'other purposes.'

4. That the company or individual acquiring water for irrigation or other purposes shall be given a clear and indisputable title to such water.

5. That holders of water rights shall have the protection and assistance of permanent Government officials in the exercise of their rights.

6. That disputes or complaints regarding the diversion or use of water shall be referred to and settled by the officials of the Government department charged with the administration of the Act, and that decision so given shall be final and without appeal.

7. That provision is made where a person or company have to trespass on lands which do not belong to them for the purpose of making surveys, &c. Upon filing a general description of their proposed undertaking and upon payment of a fee of three dollars the Commissioner and Chief Engineer of Irrigation will issue a license authorizing their engineer to enter upon all public or private lands for the purpose of making such surveys as are necessary for their undertaking.

8. That the Act provides for the securing of right of way and the amount of land to be taken as such, and for fixing the price of the same.

9. That provision is made for the prosecution of persons diverting water illegally.

10. That the unit of measurement is fixed by the Act.

11. That provision is made for the surveys of the source of water supply and for the protection of the same, and for the establishment of gauge rods in rivers and streams.

12. That the Minister of the Interior is vested with power to make such rules and regulations as are necessary to carry out the provisions of the Act, and make regulations which are necessary to give the provisions of the Act full force and effect.

As to the administration of 'The Northwest Irrigation Act,' I may here state that before the Territories were divided into provinces, the Northwest Irrigation Act was administered through the Department of Public Works of the Northwest Government, and on the formation of the Provinces of Saskatchewan and Alberta the office of Commissioner and Chief Engineer of Irrigation was created, with head office in the city of Calgary, for the purpose of administering the said Act.

Probably the most satisfactory way to make it clear as to how the above principles are worked out would be to consider the case of a company formed to construct an irrigation ditch or canal for the reclamation of any area, and trace the undertaking from its inception so as to illustrate the provisions of the law affecting such undertakings. Such an explanation will cover practically all cases dealt with under the Act, differing only in minor details for large and small schemes.

The company having been formed for the purpose of constructing irrigation works and engaging in the sale of land, with water rights attached thereto for irrigation, proceeds to make the necessary surveys to determine the feasibility and approximate cost of their undertaking, and provide the necessary information as to location and character of the works to be constructed and land to be irrigated. When this has been done, the Commissioner of Irrigation causes to be made a special survey of the land in question to prove the feasibility of the scheme before any authorization for the work is issued, and when the scheme is a feasible one then the company complete their surveys, and proceed to the next step by filing with the Commissioner of Irrigation a memorial containing full information as to the organization and financial standing of the company, the location, character and cost of their proposed undertaking, the location and character of the land to be irrigated, and the terms and price to be charged for water supplied for the irrigation of such land, together with plans and profiles. The application is duly examined and recorded in the Irrigation Office against the stream or other source from which the water is to be diverted, provided there is water available from the proposed source; if already granted, or if the examination proves the scheme does not comply with the provisions of the law, the application is refused, and the applicants notified accordingly; if approved, one copy of the memorial and plans is filed with the Department of the Interior at Ottawa, and the applicants instructed to publish a notice of their application in six

weekly issues of a local newspaper named by the Commissioner, marked copies of which are filed in the Irrigation Office as proof of such publication. If at the expiration of the publication of the notice referred to no protest against granting the rights applied for is received, the Chief Engineer issues a certificate that the provisions of the law relating to the application have been complied with, and recommends the issue of an authorization for the construction of the proposed works by the company, and the length of time to be given for the completion of the same. Should any protest against granting the application be filed during the period of publication of the notice, the protest is considered and ruled upon, and any amendments ordered are endorsed on the memorial and plans.

Having obtained their authorization, the company proceeds with the construction of the works, and if necessary, expropriate public and private lands required therefor under the provisions of the Act. During the progress of the work if complaint is made that the work is not being carried out in accordance with the law and plans filed, an inspection will be made by the Chief Engineer.

Upon the completion of the works, a final inspection is made by the Chief Engineer, who issues a certificate containing a recommendation for the granting of a final license covering the quantity of water to be granted, and this license, upon payment of the fee prescribed by the Minister of the Interior, is issued and duly registered in the Irrigation Office against the source from which water is to be diverted; the number which the license bears shows its priority of right against the source of supply. This document conveys an absolute title from the Crown, and it will be noticed in the first place that the license purports to transfer a definite quantity of water for the irrigation of a defined area, but that the transferee, to maintain his title, must live up to the provisions of the law. These three points are worthy of separate notice.

The definite quantity of water conveyed settles at once the question of the limits of the right, and no loophole is left for advancing a claim that the right is defined by size of canal or ditch, or area of land to be irrigated; the stage of the stream at which water is to be diverted is also indicated, and the means of determining this stage is settled, so that disputes as to when a licensee is entitled to take water cannot arise, and at the same time under the system of granting licenses against the three stages, viz., low water, high water and flood stage, it is possible to grant titles to all the flow of water available for diversion.

The second point referred to opens up a subject which has been prolific of much discussion and controversy in all irrigation countries, viz., shall water diverted for irrigation be an appurtenant of the land for which it is originally diverted, or a moveable right available for use anywhere? The license issued under the Irrigation Act answers the question in the plainest of terms, as the water to be diverted is granted for the irrigation of a defined area, as shown by the memorial map and plan of record, and not as a right to be used anywhere the licensee may see fit.

Having dealt with the procedure relating to the acquirement of water rights, it may be of interest to note the system and forms adopted for transfer of title to the whole or any portion of the right. After the issue of the license, it may be wholly or partly transferred by use of the simple form printed on the back and the record of the transfer having been effected, the transferee obtains a new license in his own name covering the portion of the original license transferred to him.

For the proper administration of the laws the first duty of the Government was to endeavour, by a careful system of topographical and hydrographical surveys, to determine the actual supply of water available from each source, and to accomplish this a system of survey has been carried on each year, one of the main features of the work being to determine by careful measurements and gaugings the actual supply of water available for irrigation, so as to know what quantity there is to grant.

This phase of the administration of the law is dealt with somewhat as follows: Each stream, or in fact any source from which water may be diverted, is given a

place in a register containing as it were a debit and credit account for water, the credit side being filled up from measurements and gaugings of the supply at low water, high water and flood discharge, and the debit side being a charge against the supply of rights to divert such water, acquired under the Act. A glance at the register at any time shows the exact balance between available supply and recorded rights and permits of immediate settlement of the question of whether there is water available to meet the requirements of each application as it is filed.

This system practically delegates to the officials administering the Act the power to prevent the probability of future disputes between the holders of water rights, by refusing to approve any application which it is considered might tax any source of supply beyond its capabilities and thus cause friction between recorded rights.

In conclusion it may be pointed out that, while our laws relating to irrigation are in their infancy or formative stage, and possibly weak in many respects, the guiding principle and aim of these laws and their administration is security of title, and the use of the available water supply for irrigation in such a manner as to bring the greatest and most lasting benefits to the greatest number.

The following resolution was moved by Mr. John Powdson, of Raymond, seconded by Mr. H. A. Greeley:—

Laws Relating to the Use of Water and the Administration thereof in Alberta and Saskatchewan.

Whereas, the Irrigation Act under the provisions of which water is used for irrigation in the Provinces of Saskatchewan and Alberta is recognized and admitted to be the best law extant relating to this subject; and

Whereas, the administration of this law has proved that while in its general provisions it is all that can be desired, but that in certain minor details it requires amendment to meet circumstances which have resulted from the rapid irrigation development now taking place:

Therefore be it resolved, that a committee of seven members be named by this convention who shall prepare a report as to the necessary amendments to the law, and that the report of that committee be forwarded by the Secretary of the Convention to the Dominion Government, with a request that the matter of enacting such amendments be given consideration at the next session of Parliament.—Carried.

Mr. JOHN POWDSON, of Raymond, in introducing this resolution, said: 'In my part of the Province we can see some few problems that will have to be met sometime in the future, and we feel that if some action can be taken by this convention looking to their solution beforehand, a great deal of controversy is going to be avoided. To accomplish its end the committee to be appointed will have to be one representing both the companies furnishing the water and the consumers.'

THOS. H. WOOLFORD, Cardston, Alta.—'If a man has a water supply on his land for which he has no use, has he the right to give or sell such water to a person on an adjoining piece of land?'

CHAIRMAN.—'Any water on a piece of land belongs to that land and no other, so cannot be sold. The water right and land are inseparable.'

JOHN POWDSON, Raymond, Alta.—'If a man buys a piece of land with a water right, is he compelled to pay the water right whether or not he uses the water?'

CHAIRMAN.—'It is in the contract of the company furnishing the water that the company will keep the water there whether it is used or not, and the purchaser buys on that basis. The water may not be used for a number of years, but as the company has gone to the expense of bringing the water to the land, the annual rental has to be paid whether the water has been used or not; and as long as there is any water left in the waterways from which the supply is taken the company furnishing the

water is bound by contract to supply the consumer at the original contract price. If the holder does not get water when he wants it the company is held responsible for such failure of delivery.

'Such are the provisions of the water contract of the Canadian Pacific Railway Company with which I am more intimately acquainted. The whole matter is entirely one that is covered by contract or agreement when the water right is sold, which may contain any provision on that subject.'

Mr. R. H. CAMPBELL.—'In the agreement with the Alberta Railway and Irrigation Company it is provided that a water right may be cancelled if the water rental is not paid for two years. The form of agreement submitted by the Canadian Pacific Railway Company is in the terms mentioned by the Chairman, but has not yet been approved by the department. The Government will be glad to have the advantage of the views of the people on these agreements.'

Moved by Mr. William Pearce, seconded by Mr. J. T. Hall, that a committee on resolutions for the next convention be appointed to make the report as called for in resolution number six, and that this committee be composed of three producers and four consumers of water. The motion was carried, and the following committee was appointed:—

T. J. O'Brien, Raymond, Alberta.
John Bradshaw, Magrath, Alberta.
Martin Woolf, Cardston, Alberta.
Ed. Fearon, Maple Creek, Saskatchewan.
P. L. Naismith, Lethbridge, Alberta.
J. S. Dennis, Calgary, Alberta.
A. F. Grace, Medicine Hat, Alberta.

J. S. Dennis was appointed convener of the above committee, and the committee empowered to increase their number if thought desirable.

Moved by Mr. Wm. Pearce, seconded by Thos. H. Woolford, that John Stewart, Commissioner of Irrigation, be made an ex-officio member of the above committee.—Carried.

Moved by Mr. M. Woolf, seconded by Mr. Thos. H. Woolford, that the following amendments to the Irrigation Act be referred without instructions to the committee dealing with resolution No. 6.—Carried.

RECOMMENDATIONS.

1. That the right to use the water be made negotiable and transferable.

2. That irrigation companies shall maintain and operate all laterals under their respective systems.

3. That instead of water being measured continuously, as under the present system, it shall be distributed as follows, namely:—

That a standard stream shall be 2½ second feet, and where a less amount be due in one lateral it shall be pro rata (as 2½ due in one lateral instead of being continuous), that it be measured 2½ feet pro rata or 33⅓ hours each week, or where the volume exceeds 2½ second feet and does not reach 2 standard streams it shall be pro rata as before.

4. That all streams be scheduled, and that schedules be furnished the farmer not later than May 1st, stating at what point taken, also time and amount.

5. That where any person or persons take by force or otherwise water scheduled for another, it be made a criminal offence, for which recourse may be had to the nearest Justice of the Peace.

6. That the irrigating season be extended to November 1st, and that water be allowed to remain in canal even later than that date, if practicable.

The following resolution was moved by Mr. Van Orman and seconded by Mr. J. T. Hall:—

Whereas, the holders of land acquired under the Homestead Regulations are in many cases precluded from obtaining water from irrigation canals, though their holdings be under these canals; and

Whereas, it would be impossible for financial and other reasons for them to undertake the construction of irrigation works for themselves:

Therefore be it resolved, that this convention urge upon the attention of the committee that may be appointed the case of these homesteaders, so that some amendment to the existing law may be drafted with a view to give them relief.—Carried.

The following resolution was moved by Mr. Thos. H. Woolford and seconded by Mr. A. E. Humphries:—

Resolved that this convention endorse and recommend to the committee to consider the question of compelling the irrigation companies to furnish water to all lands under their respective canals at the same rate as it is sold to purchasers of land from such companies.

The following motion was made by Mr. J. E. Varley, seconded by Mr. G. Limoges:—

'That it be the instructions of this convention to the committee to be appointed under resolution No. 6 to embody in the report to the Dominion Government the desirability for legislation to protect irrigation ditches which are or may hereafter be constructed under the authority of the Irrigation Act or any amending Acts against the encroachments of any village or municipality, and that the responsibility of protecting the public or private owners of property adjacent to irrigation works from the consequences of their operation shall be assumed by the Dominion or Provincial Governments. That a copy of such report be forwarded to the Government of the Dominion, and each of the Provincial Governments of British Columbia, Alberta and Saskatchewan.

'That it be a further instruction to said committee to suggest that all irrigation companies be brought under the jurisdiction of the Railway Commission to regulate the operation of all irrigation ditches.'

Carried, not as instructions but for the consideration of the committee.

Convention adjourned until 9 o'clock a.m., July 18.

The Chairman called the convention to order at 9:15 a.m., July 18.

The following resolution was moved by Mr. M. S. Wade and seconded by Mr. V. D. Curry:—

Resolution No. 11.—'This convention is of the opinion that it is desirable that the water laws of the Provinces of British Columbia, Alberta and Saskatchewan should be uniform, and administered by a permanent interprovincial commission.'—Motion lost.

The following resolution was moved by Mr. A. E. Ashcroft and seconded by Mr. E. Carruthers:—

Resolution No. 12.—'That this convention desires to recommend the immediate appointment of a thoroughly qualified commission to inquire into the present status of the water laws of British Columbia and their administration, such commission to include representation of the small users of water, and to report to the British Columbia Government at as early a date as possible, recommending such changes in legislation as will deal with existing grievances, while recognizing existing rights,

provide for future development, and if possible bring about uniformity in the water laws of the three provinces of British Columbia, Alberta and Saskatchewan.'—Carried.

The following resolution was moved by Mr. M. Woolf and seconded by Mr. Frank Leavitt:—

'That it is the opinion of this convention that no irrigation company or person should be allowed by the Dominion Government, or the Legislature of the Province of British Columbia, to monopolize all the water rights upon the small streams or other sources of water supply, situated in another district, to the detriment of that district, nor should be allowed to divert water from its natural watershed into another watershed.'

Mr. M. Woolf, of Cardston, in moving the foregoing resolution, said: 'I do not think it right that the Government should give to any company permission to divert water from the land tributary to that water for the use of other land fifty miles distant; allowing the company diverting the water fifteen years in which to complete the building of a distributing system. A man in buying is always influenced in his choice of land by the supply of water he hopes to have for his stock. Is the man who realizes the advantages of irrigation to be deprived of the fruits of his foresight if, by an act of the Government, lacking funds with which to buy irrigated land he acquires land contiguous to a good stream of water that he hopes, eventually, to utilize in the irrigation of his land? The water was there when he bought his land, and was one of the determining factors that influenced his selection. After he has bought land along some stream the Government, in allowing any company to divert to other lands the waters of that stream, is taking from him that which he has every reason to believe is one of the chief assets he acquired when he bought the land. I sincerely hope that this resolution will be passed.'

C. W. Peterson, Calgary, Alta.—'This is a matter that has caused much discussion in the United States. The question of whether or not the waters of a stream should be diverted from lands tributary to it should be decided on its merits. I would suggest that it be referred to the Law Amendment Committee.'

Wm. Leavitt, Leavitt, Alta.—'Irrigation is practically in its infancy in Alberta. We people to the south are acquainted with irrigation, as we have been brought up to it. For that reason we settled in a district where, when we were financially able to construct irrigation systems we could find sufficient water to meet our irrigation requirements. We know that good land without water is like good bread without butter.'

CO-RELATION OF IRRIGATION AND DRAINAGE.

(By F. W. Crandall.)

The occupation known as farming has for centuries past been looked upon as one so easy, and of such a routine nature, that few, if any, changes could be made to improve the methods in vogue. It seemed so easy to simply plow the ground, plant the seed, wait patiently for the harvest, and then garner in the crops.

One season simply repeated another in method and simplicity. The soil was supposed to be able to forever supply the needed elements to produce any succession or rotation of crops planted.

The moisture sent directly from the Heavens was considered all-sufficient, and no one thought of more being needed.

Time has proved the fallacy of this reasoning, and we now find, in very many sections, crops not more than one-half in quantity, and inferior in quality, being

produced on these once fertile lands; and at the same time added expense by way of special cultivation being necessary to produce *even* these inferior crops.

In these times, however, there is a great awakening, and the subject of farming is taking its proper place amongst the sciences where, by right of its importance, it should have been placed centuries ago.

Soil anaylsis gives us the clue from what crops we may expect the best results, and also what elements we must, in some artificial way, add to the soil in order to get satisfactory results.

Strange to say, it has been found that some soils that were considered absolutely worthless for producing vegetation of any kind, needed only more water—water applied at the right time and in proper quantities, to give forth wonderful results, water being necessary to dissolve the mineral salts in the soil, putting them in solution for plant food.

It is this subject, the artificial application of water, and some of the methods for applying it, that forms the basis for this paper.

I am convinced that it would be time wasted to enter into an argument before this intelligent convention, setting forth the reasons and advantages of the proper use of water, artificially applied for the growing of crops. This is taken for granted. It is only fogies and back-numbers who oppose it, and even this class is becoming beautifully less, as our great irrigation projects and systems make their inroads in the various states and provinces.

That the United States Government is now expending over forty-two millions of dollars in the construction of irrigation facilities and reclamation, with other large expenditures pending, gives some idea of what *we* of the States, think of irrigation.

Granting all that has been said, or may be inferred from the foregoing remarks, there is yet another side of the question, and an important one it is too. Because water is beneficial and, in the main, the results of its application are more than satisfactory, there is such a thing as great harm resulting from its improper use.

Ignorance of the laws of nature, forms a basis for a large percentage of the failures that are made in very many otherwise laudable undertakings. Because water is plentiful, and because there is no limitation as to the quantity which may be used, should not be taken as a basis for using more than the land will properly absorb, or the drainage facilities which are at hand will properly take care of.

Good *drainage* is fully as essential as a good water system. One is not complete without the other. They must always go hand in hand. The fact that land has somewhat of a slope towards a 'coulee' or creek bed does not by any means indicate that the drainage is perfect. The sub-stratum has quite as much to do with it as the slope. I have seen land under an irrigation system, with a slope of at least ten degrees, absolutely ruined by too much water being applied, incident to the close nature of the soil above a clay subsoil, and its inability to relieve itself by percolation or seepage of the surplus.

Then, again, perfectly level land may have a porous, gravelly sub-stratum, and water applied will disappear readily, no matter if it flooded many times the quantity actually needed. But such drainage, although all of the water disappears, is equally, if not more, injurious than the sloping land which has not the ability to relieve itself. In fact, I might say it is more disastrous eventually, because the very porosity of the sub-stratum affords such an easy release of the water saturated on the thin coating of soil, that it carries away the very properties of the soil most necessary for the production of vegetation, and thus leaves the land entirely 'robbed' or 'killed,' so far as its future use in concerned, the percolation, in this case, having carried the soil to a depth below where it can be taken up by the rootlets.

Take another example of level land, with a clay subsoil impervious to water. With this the greatest care must be taken or the soil, as on the sloping land previously referred to, will become saturated, and not only ruin any crop which may have been planted, but will sour the land, making it heavy and soggy, and render it unfit for cropping, without the addition of some soil-loosening material.

I know personally of hundreds of acres of orchards in California where water has been held in reserve too close to the surface, where to-day orchards and vineyards, which formerly flourished luxuriantly, are dead, and the land ruined. No fault of the water, however, but of the lack of good judgment or horse sense of those applying it, and a lack of drainage facilities.

In Tulare County, California, thousands upon thousands of acres of once fertile lands are now water-soaked and ruined. Not that water stands on the surface of these lands, but for lack of drainage facilities, the water table has kept constantly rising, until it has dissolved the alkali in the soil, and brought it in solution, so near the surface, that it has literally burned and destroyed the roots of the trees and vines, which once flourished, and ruined the soil for further cultivation.

In Santa Clara County, California, there are also qnite large sections which have artesian wells, flowing large quantities of water. These wells are in a district or section where the land is extremely fertile, and yet there is not sufficient drainage to carry off the surplus water, causing thousands of acres of otherwise fertile lands to simply grow up to tules. Such lands are of no value for agricultural or horticultural purposes, simply for the lack of proper drainage.

To reclaim these lands under present conditions, that is, by proper drainage, would cost almost or quite as much as the lands would be worth after such reclamation, on account of their being so near to tide-level.

In Tulare County there is a syndicate forming, representing millions of dollars, for erecting immense pumps, to pump the surplus water from the 'drowned lands,' conducting it to arid lands many miles away, using the water for reclaiming such lands, while at the same time draining the lands referred to. I believe this will be more or less successful, although it is a question if the alkali which has been brought so near the surface will not remain in sufficient quantities to hinder plant growth until it has been washed away several times, by flooding the land and pumping the seepage.

I have given considerable time the past few years to the investigation of different systems in the United States, Canada and Mexico, as well as in Europe, and have personally visited most of the large projects and systems which are being operated up to the present time. Taking all in all, I am led to believe, as stated in the foregoing, that it is as necessary to have a very complete drainage system, as it is to have an abundance of water for applying to the land.

Were I selecting a tract of land under any system of irrigation, I should certainly look as much to the complete drainage facilities as to the supply of water. I should take good care to see that the soil was good, of course, and that it had a subsoil that would retain sufficient water for the maturing of crops, without holding in reserve more water than was needed, or that it could relieve itself of.

The contour of the land would be a secondary matter. A few years ago one might shy at irrigating land having a slope of ten or twenty degrees, but that has no terrors of an irrigator of to-day. One has only to visit a section like Riverside, or Redlands, in California, to see how easy it is, when one understands the handling of water, to properly distribute it on slopes even geater than a twenty per cent grade. There are hundreds of other places where water is being used to good advantage on lands which have a good strong slope, and at little, if any, additional expense over level land.

Take it in the main, I am led to believe that the very best results are produced where the contour of the land to be irrigated has a fall or slope, coupled with proper subsoil, which is necessary in any case, so pronounced, that even those ignorant as to the uses and effects of water will be unable to injure either crops or land by oversaturation.

It may not be quite so easy to apply it until one becomes accustomed, but as soon as one gets the lay of the land it is no great task to distribute water on such lands.

In the great irrigation projects now being opened in various sections of the United States, as well as Canada, there are large areas of a more or less sloping

nature, under the various systems, and I believe it is safe to say that these will be found as profitable under the influences of water as any level section now being irrigated. And I believe the duty of water will be greater than on level areas, where too much is liable to be used. Take the lands of British Columbia, Alberta or Saskatchewan, I believe you will find the very best results, not on *dead level* lands, but on lands with a fair slope, affording perfect drainage.

I have spent considerable time during the last month or so looking over the lands contiguous to and covered by the Canadian Pacific Railway Company's system. I have carefully examined and analysed this soil in a large number of places, and studied the topography of the land. As this system is receiving so much notice from the press, including the very highest grade of periodicals, and as it is situated in our midst, I believe it is not too much to say, right here, that aside from having a soil second to none under any system in America, it has a subsoil admirably adapted to holding in reserve sufficient water for the maturing of whatever crops may be planted, while at the same time it has as perfect a drainage system, through its 'coulees' and slopes, as could be desired under the most favourable conditions.

I look upon the future of this project being able to demonstrate to the world the wisdom of its promoters, making these lands, which have slumbered so long for sheer lack of attention, to produce successions of crops which will astonish the world, and make this not only a populous, but one of the most prosperous sections on the American continent. Few, if any, projects are surrounded with more favourable conditions. *Abundance of water, fertile* and productive *soils, perfect drainage,* and a climate, which during most of the year cannot be excelled for its salubrity.

I believe also it is safe to say, that, aside from this project, many others where water is available, will be constructed in this great Northwest, and millions of acres, now producing but average crops, will be made to give forth abundant harvests from the now semi-arid wastes. It only remains to be seen what the results of this great enterprise will be, to induce other sections to repeat, even if not on so large a scale, what is being done in this particular part of Alberta.

You, gentlemen, of this convention, cannot proclaim your work fully done, nor discharge your full duty, until every acre tributary to an available water supply is under control of water for irrigation purposes. And every stream now carrying its supply of precious fluid to the sea be diverted to the use of man, insuring crops, and doing its part towards the building up of this, the Great Western Empire. Then, and not till then, should you say, 'my duty to my fellowmen is fully performed.'

Following the reading of Mr. Crandall's paper, the convention adjourned until 4 p.m. to allow the delegates time in which to drive out to the headgates, first engineer camp and reservoir of the Canadian Pacific Railway Company's irrigation block.

The party left the convention hall at 10 o'clock, July 18, in automobiles and carriages, and after viewing the headgates proceeded direct to the first engineering camp, where a stop was made for luncheon. After luncheon Mr. William Pearce, on behalf of Mr. J. S. Dennis, who was absent, gave a short historical sketch of the Canadian Pacific Railway Company's irrigation project, and called attention to the features of Canadian irrigation laws that seemed to appeal to incoming settlers:—

'As most of you are doubtless aware, a land grant of 25,000,000 acres of land was made by the Dominion Government to assist the Canadian Pacific Railway Company in the construction of its line of road. The grant was made on the canal checkerboard system of every odd section extending back for twenty-four miles on either side of the railway. However, there was a provision in the grant to the effect that the railway company would not be compelled to accept land "not fairly fit for settlement." As a result of this provision the railway company rejected certain lands between Moosejaw and Medicine Hat as being unfit for settlement. In their final settlement with the Government the company agreed, however, to accept 3,000,000 acres of land in a solid block, extending 150 miles east of Calgary, along the main line of their road, provided that at least half of the land could be brought under irriga-

tion, the Government to bear the expense of the surveys to determine whether or not that proportion of the area could be brought under irrigation. This the Government agreed to, and proceeded with the surveys, from which it was estimated that slightly more than half the block could be irrigated. After having accepted this block of land the railway company finally undertook, in 1903, extensive and detailed surveys to indicate how the work could best be carried out. These surveys confirmed those made by the Government, and also served to indicate the probable cost of the undertaking. With this information before it, the company finally decided to undertake this great work, and canal construction was begun in 1904.

'In developing this system the block was divided into three sections, Western, Central and Eastern, of about one million acres each, and the work is being carried on along the lines of development of sections in the order named.

'In the Western section about 350,000 acres are to be brought under irrigation, and the following brief description of the works to supply water for this area will indicate the character and the magnitude of the work.

'The water for the irrigation of the Western section is diverted from the Bow River at a point about two miles below the city of Calgary. From there it is carried south and east through a main canal seventeen miles in length, which is sixty feet wide at the bottom, one hundred and twenty feet in width at the water line, and carries water to a depth of ten feet.

'This main canal delivers water to a reservoir, for which a natural depression has been utilized, and where, by the erection of a dam, a body of water three miles long, half a mile wide and forty feet deep has been provided.

'From this reservoir the water is taken out in three secondary canals, A., B. and C., and carried to the different districts that are to be irrigated. These secondary canals are about thirty feet in width on the bottom, at their western end, and carry water to a depth of eight feet, their combined length being one hundred and fifty miles.

'From these secondary canals the water is again taken out and distributed in each irrigation district through a comprehensive system of distributing ditches that bring the water to each one hundred and sixty acres, or quarter-section of land to be irrigated. The combined length of these distributing ditches is about eight hundred miles.

'In the Western section of the irrigation block there will, therefore, be the following mileage of waterways constructed and maintained by the company:—

Main canal	17 miles.
Secondary canals A., B. and C	150 "
Distributing ditches	800 "
	967 "

'In addition to these channels there will be several hundred miles of the small distributing ditches constructed by the farmers to distribute the water over their farms in the process of irrigating.

'The structures consisting of headgates, spillways, drops, flumes, measuring weirs, highway bridges, which are constructed on the main and secondary canals and distributing ditches, run into the thousands in number, and all of them are erected and maintained by the company.

'In completing the work in the Western section of the block, the following amount of earth will be moved:—

Main canal	2,500,000 cubic yards.
Secondary canals A., B. and C	5,000,000 "
Distributing ditches	750,000 "
	8,250,000 "

'The preliminary surveys proved that about the same percentage of waterway and excavation will apply to the Central and Eastern sections, and the completed work will therefore stand as follows:—

Main and secondary canals and distributing ditches	2,900 miles.
Amount of material moved in completing the project	24,750,000 cubic yards.

'The first intention of the engineers was to divert the water for the irrigation of the Central and Eastern sections from the Bow River by a second main canal heading in the river some sixty miles east of Calgary; but subsequent surveys have indicated that it may be found better to enlarge the present main canal and secondary canal B., in the Western section, take out the water for the Central and Eastern sections at the present intake near Calgary, and transport it through these enlarged channels to the districts mentioned. Detailed surveys are now being completed to determine which is the better system to adopt so that a decision may be arrived at by the time that construction work in the Western district is completed.

The cost of this great undertaking is estimated at about $5,000,000, and this, together with the area of land in the block that it is proposed to irrigate, justifies the title given this scheme: 'America's Greatest Irrigation Project.'

'The success in operating an irrigation system must of necessity be dependent on the care exercised in the first instance in laying out and in constructing the main, secondary and distributing ditches, an unusual amount of care exercised in order to reduce the chance of break in the banks, or delay in the delivering of water, to a minimum. The manner in which the work is being performed led to the following statement by Dr. Elwood Mead, Chief of Drainage and Irrigation Investigations, Department of Agriculture, Washington, the leading irrigation engineering authority on this Continent:—

"The chief problem of the main canal was to build a waterway which would be free from leaks and all danger of breaks. The precautions which have been taken to insure this are greater than those usually observed. The specifications for stripping the surface soil and the packing of embankments are rigorous, and are being lived up to in all the work I inspected, and I have never seen more compact or uniformly solid banks than those being built."

'The same care has been followed in the design and construction of the main headgates and all the other structures on the main and secondary canals, and possible delays and mishaps in the delivery of water from washouts and weak construction have been overcome, as far as it is possible, in the works connected with the western section of the irrigation undertaking.

'This irrigation enterprise differs from the other irrigation undertakings on this continent in certain main features that are, I believe, deserving of especial mention.

'In the first place, the project has been undertaken for the definite purpose of transforming a large area which is at present unsettled and non-traffic-producing, into a closely settled and prosperous farming community, with the attendant traffic receipts that always result from such conditions. For this reason the work has been undertaken not to make money from the irrigation project itself, but as a colonization and future-producing investment.

'Following this purpose the company has departed from the usual practice on this continent of building only the main and secondary canals to bring the water to the area to be irrigated, and then leaving it to the purchasers of the irrigated lands to get together and build the distributing ditches to deliver the water to the individual farms. In this undertaking, not only the main and secondary canals are built, but, also, the vast system of distributing ditches so as to provide for the delivery of the water at some point on each quarter-section of irrigable land for sale. The purchaser of such land can see on the map from which he buys his land, precisely where the water is to be delivered to him, and need be at no bother of securing the co-operation

of his neighbours in building and maintaining the ditches to bring the water to his farm. This is a departure which appeals strongly to settlers from irrigation districts who are acquainted with the trouble and the annoyance met with where the usual practice is followed.

'Another feature in the company's undertaking which marks it as differing from other irrigation projects on this continent is, that the maps from which lands are sold show in plain figures on each quarter-section the area which is irrigable; this information being derived from the exhaustive contour surveys made by the company. The usual practice is to call all land having a lower general level than the ditch supplying it with water, irrigable land, without going to the expense of proving by actual and detailed surveys precisely how many acres of such land can be irrigated by the economical distribution of water.

'Having undertaken to deliver the water at some point on the boundary of each quarter-section of irrigable land sold, and selling such land from a map which shows from detailed surveys precisely how many acres of such quarter-section can be irrigated with water supplied at that point, the company goes a step further and provides for a ten per cent reduction in such irrigable area, in the annual charge for water, so that portions of the irrigable area used for buildings, roads, &c., are not charged for water which cannot be used.

'While the foregoing features are unique in connection with irrigation undertakings on this continent, and will, it is thought, appeal strongly to those who may contemplate buying irrigated lands in this particular block, there are other features in connection with the colonization of irrigable lands in this portion of Canada that we find make a great impression upon the minds of those who have practiced irrigation to the south of the International Boundary, and should, by those interested in development of Western Canada, be brought prominently to the attention of all those people who are contemplating settlement here.

'For instance, in the colonization work of this company it has been found that our law relating to the use of water for irrigation particularly appeals to the intending settler, whether or not he has had experience in irrigation farming, for he seems to realize that the permanency of the title to the water he has to use, is a matter of very great importance to him.

'Fortunately, our law is one that is easy to explain and commend and its terms appeal strongly to all settlers from south of the line where there has been so much litigation over water rights.

'In our work of colonization we have naturally met with many large parties coming here to inspect our lands and irrigation construction work, and their comments on the permanency of our construction have been very gratifying to us, inasmuch as many of them are from the States of Colorado, California, Idaho and Utah, and are thoroughly familiar with and in a position to pass an intelligent opinion upon this class of work. They all seem impressed with the fact that we are sparing neither work nor money in so constructing our canals as to avoid all possible chance of delay or failure to supply water through faulty construction.

'The very low maintenance charge of fifty cents an acre is another point which appeals to the irrigation farmer from south of the line, where they are accustomed to much higher charges for water through canals that do not show the same evidences of care and expenditure in their construction as is found here. They are also very favourably impressed with the fact that this small charge is fixed for all time, and not subject to the fluctuations they are accustomed to in districts where the entire cost of repairing or renewing the canals and ditches in seasons of floods and washouts falls on the water users.

'Our demonstration farms, in charge of expert irrigationists, whose work it is to demonstrate just what can be done here under irrigation and to assist settlers with advice and their time, are strong factors in producing a favourable impression upon newcomers and prospective purchasers.

'We have established a telephone system throughout our block, and the settlers recognize the fact that through this system they will be enabled to keep in close touch

with their immediate market centres. The telephone brings them within talking distance of Calgary and their neighbours, and does away with much of that feeling of remoteness, which has always been such a decided drawback in the opening up of farms and in the establishment of homes in a new country.

'A large proportion of the homeseekers who are coming in here are composed of the finest class of settlers the West has known. They are possessed of means, and most of them have had long experience in irrigated districts, and are coming here expressly fitted to obtain the very best results from the rich soil, splendid natural grazing, the opporunities offered for diversified farming, and are fortified against absence of moisture by the assurance that irrigation affords.'

The party was then driven over to the main reservoir, a body of water a half a mile wide by three and a half miles long. After inspecting the reservoir they were driven back to the city and convention hall.

The Chairman called the convention to order at 4 o'clock, July 18.

The following resolution was moved by Mr. Thos. H. Woolford and seconded by Mr. M. S. Wade:—

Permanent organization.—Whereas, irrigation development in Western Canada has during recent years made enormous strides, until the area now under irrigation and covered by schemes actually under construction equals in magnitude one-quarter of the total irrigated area of the whole of the United States; and

Whereas, vast interests are now bound up in the irrigation development of Western Canada, requiring intelligent public appreciation and broad gauge legislation and administration; and

Whereas, the tendency on the part of the public and public men in the past has been to attach due importance to the subject of irrigation in Western Canada; and

Whereas, in broad principles, it is desirable and in the interest of western agricultural development that an organization should be created which can become the mouthpiece of irrigation interests:

Therefore be it resolved, that this convention be perpetuated as an annual institution, and that a constitution, by-laws and other machinery be provided, having in view permanent organization.—Carried.

Mr. Thos. H. Woolford, of Cardston, in introducing the foregoing resolution, said: 'The fact that we are gathered here at this time seems to me, in itself, sufficient warrant for this resolution, and I hope that it may be passed.'

An invitation was then read by the Secretary from the Fifteenth National Irrigation Congress, to be held in Sacramento, addressed to one of the members of the convention. In the invitation there was a desire expressed that the irrigation congress about to be held in Sacramento might become an international organization. After quite a lengthy discussion, it was moved and carried that the convention approve of the idea of an international organization, and if any members of this convention should attend the National Congress, that this approval be expressed there.

Professor L. G. Carpenter, of Colorado, was then called and introduced by the Chairman, and made the following address:—

ADDRESS BY PROFESSOR L. G. CARPENTER, I.E.

Afternoon Address.

'I regret exceedingly that I could not get to the Convention earlier, but was detained by bad weather. But even if late, I can assure you that it gives me great pleasure to be able to attend and address this gathering.

'I consider Colorado an older sister to Alberta in irrigation work, and hope that Alberta will not have to experience the difficulties which Colorado went through in the development of irrigation. I shall certainly be glad to render all the assistance in my power to further the cause of irrigation in Alberta and Western Canada.

'I am not very well acquainted with Canada, but since meeting Messrs. Dennis and Pearce some years ago in Denver, I have endeavoured to keep in touch with Alberta. But this occasion is the first upon which I have been able to be within its boundaries.

'The Anglo-Saxon race has been behind in the development of irrigation as it has with its civilization. The highest and earliest development of civilization has been in countries where irrigation has been practised even before the Christian era, as, for instance, in Egypt, China, Arabia, &c. Practically every country in the world has practised irrigation to a certain extent.

'Following the lines of irrigation, I will give Colorado as an example of an irrigated community and set forth a few lessons which the people there have learned in irrigation. There are two kinds of irrigation and both are somewhat paradoxical. First, irrigation may be carried on as a necessity, as is the case in a hot country, where the rainfall is somewhat irregular; and second, it may be carried on as a profit and a fertilizer. When irrigation is used in hot countries small quantities of water are used, and when carried on in cold and wet countries large amounts of water are used. There is no middle course in irrigation. Water is as a necessity part of the plant food. Every pound of vegetation requires three hundred pounds of water. To produce one ton of alfalfa, wheat, or other grain it would require three hundred tons of water, or three inches of water over a space sufficient to produce one ton. But if the supply of water is not confined to three hundred tons, and more water can be supplied, which would give more than three inches of water over a sufficient space to produce one ton, then the basis is, the greater increase of water, the greater increase in crop.

'Irrigation is practised quite extensively in nearly every country in Europe, and the basis of work there is "The more water the more grass," and the water given there is to some extent a weak fertilizer. In Italy, where the practise of irrigation was started thousands of years ago, there is practically no cultivation, and the work there is largely carried on for the irrigating of land to produce good fodder for cattle, sheep, &c. The country has gone to considerable expense in getting water for the growing of grass. Irrigation is carried on there principally in the winter and spring, but small quantities of water are run over the land in summer. And, although irrigation is carried on so extensively the rainfall averages about 36 inches. In Italy, irrigation has been doubled during the past thirty years, which fact proves that the practise there must pay, although there were many years during which good crops could be grown without the aid of irrigation.

'In many places in Colorado a supply of water is being constantly run over the grass with the best of results and conditions in Alberta are such that a similar practice could produce like results.

'The cheapest figure at which land can be purchased in Colorado, with water right, is $75 per acre, and this but very rarely and only in the northern part of the State, while the price of the best irrigated land in the State with water right runs from $150 to $200 per acre. About fifteen years ago land could be had at from $50 to $60 per acre, and as the land increased in value it necessarily had to produce more crop in order to prove a good paying business proposition. As to the value of water in Colorado, it may be said that three years ago the cost of a water right was from $5 to $10 per acre, and at the present time the cost is from $50 to $80. Recently $3,000,000 has been expended for reservoirs, so that now in some parts of the State, owing to the fact that water can be supplied continually, crops are in a fair way of being raised the year round.

'It has been found that the change in temperature during the growing season is not as great as the average for the year.

'Solar power is the motive power that causes crops to grow and this power runs

one-horse power to the square yard per day. An increase in length of day means a greater amount of solar power and during the growing season in the north, particularly in Canada, the day is very long, so that there is a larger aggregate of sun power, which gives a larger growth to the crops. Irrigation co-operating with this power by supplying moisture to the roots, furnishes the best qualities for growth and development attainable.

'It will be found that the best quality of seeds that can be obtained anywhere is under irrigated growth, and that seven-eights of the produce of the world is raised under irrigation.

'I find that some of the people here are not accustomed to irrigation. One of the most noticeable conditions being that irrigation is overdone, to some extent, sometimes to the detriment of the land and sometimes of the crop. Just the right amount of water necessary for the growth of the plant should be measured, that is, from 12 per cent to 20 per cent of the three hundred pounds of water necessary to grow one pound of vegetable matter should be absorbed by the plant. In the case of too little being applied the plant will wilt, turn yellow, and die, and in the case of too much water the plant will be unable to procure sufficient air and will drown, as plants. similar to every other growing thing, need air. And, following the fact that plants cannot exist without air, water can sometimes be applied in great quantities, but must be *kept moving*, as water contains air, and if a sufficient quantity of water travels over the plant enough air can be taken from the water to sustain the plant. *Just the right amount of water in the soil is the object that must be attained.* A peculiar fact is that after water has travelled over about one hundred yards of meadow it is no longer fit for use.

'One of the greatest difficulties in irrigation is the level distribution of water over the land surface. It is very hard to run water evenly over rough land, and in consequence much more water must be used than is necessary. People in Colorado are beginning to find that it pays to smooth the ground in order that the water may flow uniformly when applied, and by doing this they find that a better crop is produced and a large amount of water saved, which last fact is of great advantage to the State. In this respect rain-water has the advantage over irrigation in that it is well distributed in falling.

'Sheep raising is one of the greatest industries in Colorado, but it was owing to an accident that the fact was found that alfalfa was a first-class fodder for sheep. Alfalfa is one of the most productive crops on irrigated lands, and its value has doubled since sheep raising commenced in the State. Sheep manure has also proven a very good factor in the successful production of crops.

'Sugar beets are also grown successfully in Colorado, and bring in a large cash income. But to grow sugar beets successfully requires first-class farming, as every increase in acreage raises the profit.

'But the bulk of the agricultural products of Colorado are the more common products, such as alfalfa, wheat, &c. Alfalfa is really a product of irrigation agriculture.'

REPORT OF COMMITTEE ON PERMANENT ORGANIZATION.

'We, your Committee on Permanent Organization, beg leave to make the following report:—

'By unanimous vote of the committee, we make the following recommendations:

'That the name of this organization shall be The Western Canada Irrigation Association, and that the permanent organization be composed of an

'Honorary President,
'President,
'First Vice-President,
'Second Vice-President,
'Secretary-Treasurer.

[10221—5½] Intake of Ditch, East End, Sask.

Stacking Hay, East End, Sask.

Standard Highway Crossing, C.P.R.

'Elective Board of seven members, with the following officers to act as chairman of the Board in the order named:—

'1st. President.
'2nd. Vice-President.
'3rd. Second Vice-President.

'In the absence of all these officers at any meeting, the other four members shall select a chairman from among their number. We recommend that this convention now proceed with the election of officials for the ensuing year, and also make a selection of the point at which the next convention is to be held. Upon election of said officers they to decide who may become members, annually or otherwise, and to establish fees, &c. The members of the Executive Board to draw up a constitution and by-laws to be approved at the next annual convention.'

The report of the committee was unanimously adopted.

Nominations were then called for to decide upon the meeting place of the next convention. Following a very spirited but friendly discussion, Vernon, British Columbia, was finally selected as the next meeting place. The election of officers for the next meeting was then proceeded with, and resulted as follows:—

Honorary President, His Honour, Lieut.-Governor Dunsmuir, of the Province of British Columbia.
President, Hon. F. J. Fulton, K.C., Victoria, B.C.
First Vice-President, J. S. Dennis, Calgary, Alta.
Second Vice-President, W. C. Ricardo, Vernon, B.C.
Secretary-Treasurer, W. R. Megaw, Vernon, B.C.

The following Executive Board was then elected:—T. W. Sterling, Vernon, B.C.; John T. Hall, Medicine Hat, Alta.; Wm. Pearce, Calgary, Alta.; J. A. McKelvie, Vernon, B.C.; A. E. Humphries, Lethbridge, Alta.; Thos. H. Woolford, Cardston, Alta.; Chas. W. Peterson, Calgary.

A motion was then made and carried that the committee proceed to prepare constitution and by-laws.

The convention adjourned to 8 p.m.

The Chairman called the convention to order at 8 p.m.

A motion was made and carried that the proceedings of the convention be published.

Chairman R. B. Bennett, Hon. F. J. Fulton, C. W. Peterson and J. R. Wheeler were appointed a committee to take this matter in charge.

A vote of thanks was then extended to the Calgary Press for publishing the proceedings of the convention.

A motion was then made by A. E. Ashcroft, seconded by M. S. Wade, that the Bulletin of Irrigation Laws, with explanations by Mr. J. S. Dennis as addenda, be published.—Carried.

A vote of thanks was then extended to the Canadian Pacific Irrigation Company, The 100,000 Club and the Canadian Pacific Railway Company for courtesies extended to members of the convention while in Calgary.

A vote of thanks was also extended to the committee who primarily had the convention in charge, and to Lieut.-Governor Forget.

A vote of thanks was extended to Prof. L. G. Carpenter, and the hope expressed that he might meet with the convention next year.

A vote of thanks was then extended to the Chairman and Secretary of the convention.

After a vote of thanks to all those who had addressed or read papers at the convention, Prof. L. G. Carpenter was again called upon, who after a short address devoted the remainder of the evening in answering questions asked by the various delegates.

EVENING ADDRESS.

(By L. G. Carpenter, I.E.)

'As I said this afternoon, it gives me great pleasure to attend this convention, and my one regret is, that I could not make the necessary arrangements to be present earlier.

'With no limitations of latitude from the Arctic Ocean to the Gulf of Mexico there pervades the West a certain spirit of independence bred by the forced self-sufficiency of those hardy pioneers who wrested that portion of the continent from the savage to make of it a home for millions of our race, that makes for the sweeping aside of many of the precedents and prejudices of older communities. Recently I ran across a very striking example of this spirit as displayed by the early settlers in one of the Rocky Mountain States. Having occasion to look up some of the old mining records there, I happened upon the minutes of the first miners' meeting held in that district back in the fifties. The first resolution passed was, "Resolved that we be governed by the laws of the United States." It seemed ludicrous upon the face of it, but when one stops to consider that back of and underneath it all there was that rugged independence which seemed to say, "We accept the laws of the land, not because we have to, but because they seem good to us," we realize that these men were capable of working out their own salvation in their own good way. And be it said to their credit that where the law seemed to conflict with their ideas of strict justice, as between man and man, they usually declared themselves as being long on justice and short on law.

'In the irrigation legislation of the West many instances will be found suggesting a parallel to the action taken by those early miners. When a new condition of affairs comes before the public, new laws have to be made to fit those conditions. However, laws are often made which do not fit the conditions and a readjustment has to be made in order that the two will coincide.

'The development of irrigation in America has been very slow. And while it is as old as civilization itself in many countries, it is in Anglo-Saxon countries comparatively modern. Consequently it has called for the enactment of many and oftimes conflicting laws.

'With the development of a new idea the changes brought about by its adoption are bound to be gradual. While the law of riparian rights is centuries old, the United States Government has recently recognized the right to appropriate water for three necessary purposes, viz.: domestic, manufacturing and agriculture. This is a great step in favour of irrigation in the West, as it means that lands adjacent but not contiguous, to a stream are entitled to their share of the waters of that stream.

'It is only within the past six weeks that the final echos of this legislation have died away.

'Legislation of this character is certain to meet with great opposition. For example: Missouri, Kansas, Arkansas and neighbouring States not practicing irrigation can see no justice in the Government allowing Colorado, for instance, where irrigation is extensively practiced, to divert water from its natural channel. Naturally, those States not practicing irrigation still hold to the old law of riparian rights, and it required Federal legislation to settle the dispute.

'Another obstacle irrigation has met with in the States is the antagonism of the navigation companies. To divert water for irrigation it frequently becomes necessary to dam a navigable stream. Naturally, this means a bitter war with the navigation companies, but I contend that the country will derive greater benefit and profit from irrigation than it ever can by the navigation of our small inland streams.

'Of course, the development of irrigation has been attended with many mistakes

and has had many obstacles to overcome, but I am happy to say that everything now seems to be gradually working out in a satisfactory manner.

'Many of the people now moving into this province are unacquainted with irrigation, and as one of the primary objects of this convention is the dissemination of knowledge pertaining to irrigation, I hope that those present have at least acquired a theoretical knowledge of its purpose and workings. The knowledge thus gained may not be put in practice for some time, but when the time comes that they do need it I hope they may profit materially through the work of this convention this year and in the years to come. Everyone at all interested in the development of Western Canada should take a very lively interest in furthering the work of irrigation.

'Coming back to the question of riparian rights and irrigation, I wish to call attention to what has commonly been designated as the "Colorado Idea." When the irrigationists of certain parts of the State, without authority, ignored the riparian rights of those below them on a stream they naturally came into conflict with the courts. After years of litigation the courts finally decided that inasmuch as irrigation could not be made to fit in with riparian rights, that the latter would have to be so construed as to fit in with irrigation. As an instance of disputes that have taken place in the past I can cite you to the fight between Fort Collins and Greeley, in the northern part of the State.

'Fort Collins and Greeley are both situated on the Cache la Poudre River, with the natural advantages in favour of Fort Collins, that town being situated several miles above Greeley. Fort Collins constructed an irrigation canal, and to the complaints of the people of Greeley who were without water for irrigation, turned a deaf ear. In retaliation Greeley constructed a canal around Fort Collins and tapped the river above that town. Of course, the boot was on the other foot then, and the legal battle terminated in two Water Commissioners being appointed, one, the Upper Commissioner, to see that Fort Collins did not take more than its share of water, and the other, the Lower Commissioner, to see that Greeley received its full share of the water. This arrangement worked all right until the Commissioners became involved in a dispute as to the rights of their respective districts, which dispute terminated in the appointment of a middle or central Commissioner. His position seems the unhappiest of the lot, for he is between the upper and the nether mill stone. The Commissioner at Greeley complains that the Central Commissioner will give him no water, while the Central Commissioner is disclaiming any blame for the shortage of water, but lays it all at the door of the Upper Commissioner. So it is always a case of the man above being to blame.

'I once had a conversation with an Arab superintendent of a middle division in Egypt, and he told me the lower superintendent was continually complaining to him while it was the upper commissioner who was all to blame—from which I gather that human nature is pretty much the same all the world over.

'But the troubles of irrigation are yearly growing less; a few reasons being that the people make water go farther, do better farming, and find that the water comes to them more easily if they don't worry.

'The people in the west were very sceptical when irrigation was first mentioned there, and it took a theorist such as Horace Greeley to convince the people of the soundness of the idea. And when irrigation was first practised the people found that they could not build ditches that would hold water, and could not bring the water to the right place. Within a few years several companies, which were not on a strong financial footing, built big ditches, and then found that the cost of maintenance was so large that they had to charge a very high water rate during the time that settlers were coming into the country. To correct this they sold the land and water combined, as the land without the water was of no use, and the water alone was too high to bring purchasers.

'Speaking in regard to storage, I wish to state that the supposedly inexhaustible streams will in time give out, so that in time reservoirs must as a necessity be built. With reference to Colorado, one of the advantages of storage for water is that irrigation could be carried on all the year round. For instance, some of the farmers want

to grow potatoes, and the ground has to be irrigated in August. In consequence, a reservoir has been built which paid for itself in one season. Profiting by this experience, many others have since been built. Another advantage is that reservoirs may be built on comparatively dry streams and fill without noticeable decrease in the volume of water in the stream.

'For fear that in my talk I have failed to touch upon those points which may be of great importance to you, I feel that it would be a very good idea for the delegates to ask questions upon such points, and I shall endeavour to answer them.'

To the various questions put by members of the convention, Mr. Carpenter made the following replies:—

1st. 'Irrigation may be practiced either as a matter of necessity, as a matter of insurance, or as a matter of increase of crops. In any of these cases it is found that the area devoted to irrigation constantly increases and never lessens. Where the rainfall is relatively large the practice spreads more slowly. In the valley of the Po, where the rainfall is nearly 36 inches per annum, the land given to irrigation has more than doubled in the last thirty years. The average rainfall is as much as that of an extreme year in Alberta. While you have had for a few years back more than the usual rainfall, the average is not far from that of Colorado, namely 14 inches per annum, and, hence, there will be many years in which irrigation in Alberta is an absolute necessity. Aside from this fact, the increase in the growth of crops, the certainty of greater yield and the freedom from failure is such that I would by all means select land that could be irrigated either for my own use or as an investment.'

2nd. 'Notwithstanding the various reports concerning dry farming in Colorado, it cannot be said to be a success. There are areas near the foothills, and near the irrigation ditches, that have given large yields of winter wheat, especially during the past few years when the rainfall has been excessive in Colorado, as it has been in Alberta. Experiences of old settlers, extending over nearly fifty years, have shown these variations in rainfall extend back to the earliest times. There have been some years when the grass on the plains has been good, and other years when there was not enough rainfall for it to start. On the plains proper the crop production by dry farming is small. If the dry farming is used as an adjunct to stock raising little can be said against it, but when used to induce settlers to settle on the plains, with the idea that they can make a living on a quarter-section of land by dry farming, it is an injury to the plains and means ruin to the settler. The old settlers do not take any stock in dry farming, and where it is practiced it it because water cannot be obtained.'

3rd. 'By your question as to what extent irrigable lands have increased in value since this system of farming was first introduced, I presume you mean dry farming. The irrigable lands have been steadily increasing in value during the past twelve years, having more than doubled in value in that time. That is, they have increased from $50 to $100 or more. A great deal of this land cannot be had for less than $150 to $200 per acre. The lands above ditches bring from $7 to $10 to $15 per acre. This has been effected by the general desire for land, and it is about the prices which these lands would bring for purely grazing purposes.'

4th. 'My visit to the Canadian Pacific Railway irrigation scheme was unfortunately not so complete as I desired, for I did not see the settlement near Strathmore. My knowledge of the situation, therefore, is based upon my study of the maps, upon such previous knowledge as I have had of the country, and upon my trip twenty miles down the canal. The soil is such that it should respond readily to the application of water. The slope is such that as a whole, irrigation should be practiced with comparatively little difficulty. Some smoothing of the land might be necessary, but this would vary with the different tracts. Irrigation ought to increase the value of the land very materially by increasing the productive quality. The works seems to be well planned and constructed. They are remarkable for the fact that little or no fluming is necessary, and have the minimum number of structures which are difficult to maintain. It would appear that this should be successful in every way.'

The convention adjourned to meet in Vernon, B.C., 1908.

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